Major Weed Family Identification Guide

Professional Development Center • Plant Protection and Quarantine
Animal and Plant Health Inspection Service • UNITED STATES DEPARTMENT OF AGRICULTURE

MAJOR WEED FAMILY IDENTIFICATION GUIDE

Major Weed Family Identification Guide

Professional Development Center
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
UNITED STATES DEPARTMENT OF AGRICULTURE

First Edition, December, 1980

Developed by

Creative Universal, Inc.
21700 Northwestern Highway
Southfield, Michigan 48075

Under the Direction of the

Professional Development Center
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
UNITED STATES DEPARTMENT OF AGRICULTURE

CONTENTS

PREFACE

A weed is any plant growing where it is not desired. Noxious weeds, or those with aggressive growth characteristics, can cause serious social and economic problems when introduced into an agricultural or other ecosystem in which natural restraints no longer control their development.

The Federal Noxious Weed Act of 1974 provides regulatory guidelines for protecting American agriculture from both the invasion and interstate spread of new noxious weeds. This legislation was initiated by organizations and individuals concerned over the loss of food production due to weeds and the tremendous cost of weed control.

Plant Protection and Quarantine's (PPQ) goal is to prevent the entry of new noxious weeds from foreign countries and, in cooperation with the States, to suppress or eradicate infestations of weeds before they can become widespread in the United States. PPQ personnel will be actively involved in the detection, interception, and identification of noxious weeds.

This guide has been prepared by the PPQ Professional Development Center and Creative Universal, Inc. as part of a comprehensive Noxious Weed Port of Entry Inspection Training Program. It will enable you to identify most noxious weed propagules to family, and used in conjunction with other references, it will help you identify propagules to species. It has been designed as a reference book that will be useful long after the training has been implemented.

If you have any questions on the Noxious Weed Port of Entry Inspection Training Program or this guide, please feel free to contact the Professional Development Center.

Harvey L. Ford
Deputy Administrator
Plant Protection and Quarantine

ACKNOWLEDGMENTS

The Professional Development Center extends its sincere appreciation to the following persons for their outstanding efforts in preparing, reviewing, and producing this guide:

Charles R. Gunn	Botanist, Science and Education Administration — Agricultural Research
James Lackey	Botanist, Bayou Botanical, Inc.
Robert L. Lazor	Biologist Supervisor, Bureau of Aquatic Plant Research and Control Florida Department of Natural Resources
Paul F. Sand	Staff Officer, Pest Program Development and Aircraft Operations
Donald R. Thompson	Staff Specialist, Port Operations Development
William O. Wade	Section Leader, Special Projects — Professional Development Center

HOW TO USE THIS GUIDE 1

This guide is designed to aid you in identifying the families of weed seeds, or in the case of aquatic weeds, the families of the plants themselves. It is not designed to aid you in identifying a plant or seed to genus or species. Included in this guide are those families containing weeds regulated under the Federal Noxious Weed Act of 1974, plus families containing weeds that are likely to be regulated in the future. For an up-to-date list of regulated weeds, contact:

USDA, APHIS, PPQ
Regulatory Support Staff
Federal Building — Room 635
6505 Belcrest Road
Hyattsville, MD 20782

This guide is divided into four major sections: Terminology, Family Identification, Family Catalog, and Aquatic Families. Terminology describes the structures and other features of plants and their seeds that you will need to know to use this guide. Family Identification is where you start once you have isolated a seed whose family you wish to identify. This section gives you three different methods for identifying the family of a seed. The Family Catalog describes in detail each family, and contains photographs of representative species in the family. Use this section to verify that the family you determined by using the Family Identification is correct.

The Aquatic Families section contains both family identification and a family catalog. Use this section in

the same way that you use the Family Identification and Family Catalog sections for seeds. Because aquatic weeds are more likely to reproduce from plant parts than from seeds, the information in this section will help you identify the plants themselves.

This guide also contains a Glossary and Index. The Glossary briefly defines botanical terms used in this guide. The Index alphabetically lists common names, and generic names of plants, and identifies their scientific family names.

TERMINOLOGY 2

Seed and plant identification requires an understanding of structures and other features that make each plant or seed distinct. For plants, you will be looking at what are called the vegetative parts. For seeds, you need to know primarily the sexual parts of a plant. But before you learn about vegetative and sexual parts of a plant, you need a clearer definition of the term "seed."

A seed is not always a seed. A seed, in general use, is any small, self-contained reproductive structure that, when planted, produces a plant. You've probably purchased grass seed to repair a lawn. Grains, such as wheat or oats, are called seeds. Often, acorns and other nuts also are referred to as seeds. But, scientifically, nuts and grains, including grass seed, are types of fruits, and not seeds. So the "seed" you wish to identify may in fact be a fruit, and this distinction is very important to family identification.

Up to this point in the guide, "seed" has been used in the general sense. Henceforth, "seed" will be used in the scientific sense. So next, you need a broader term that includes both seeds and fruits. That term is

propagule. A **propagule** is any structure of a plant that will reproduce, or propagate, a plant. Besides seeds and fruits, vegetative parts of a plant, such as leaves and stems, are sometimes propagules, as in the case of most aquatic plants.

This section outlines the basic structures you will encounter, and gives essential terminology to begin identification. Terminology specific to a family or terminology of restricted use will be defined elsewhere as needed. All terms can be found in the Glossary.

VEGETATIVE PARTS

The three basic vegetative parts are the root, stem, and leaf, as shown in Fig. 1. All plant forms result from modification of these three basic parts. Stems are usually above ground and grow up. But some stems, rhizomes, run laterally below ground and look like roots. Other underground stems are enlarged to form tubers, like in the potato. Rhizomes and tubers sometimes are reproductive structures, or propagules. Leaves, which

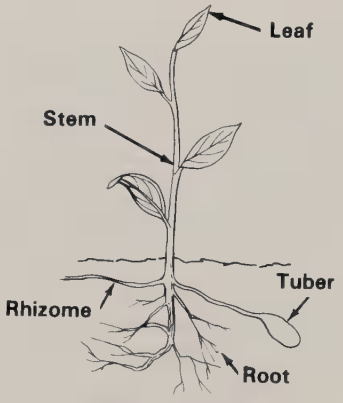
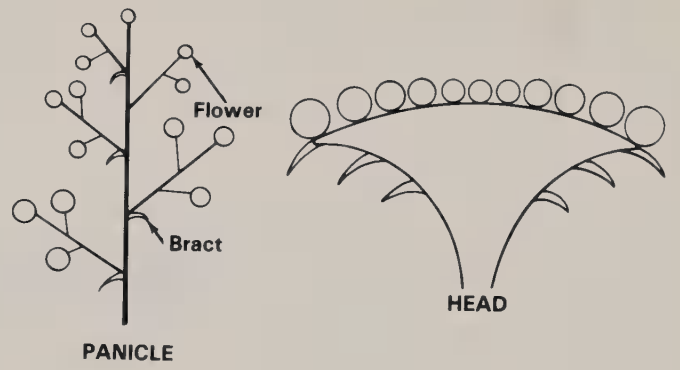


Fig. 1. Basic vegetative parts.



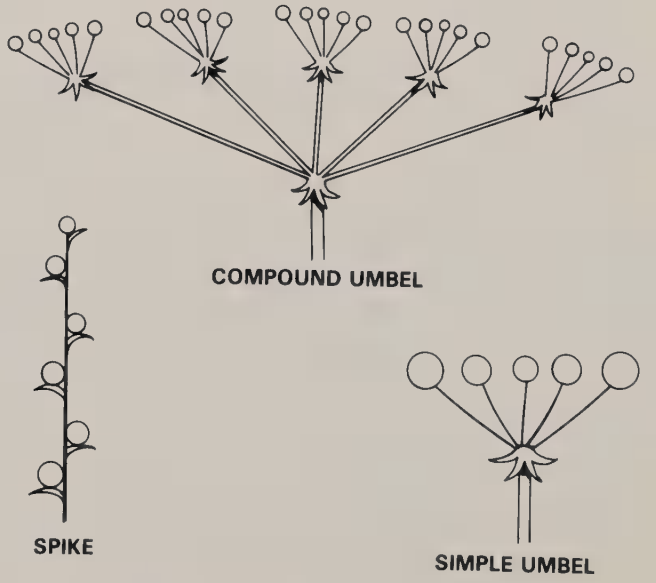


Fig. 2. Types of flower clusters.

arise also on stems, are usually above ground and green, but they may be non-green and clustered around bits of stem to form bulbs, like in the onion. You may see small bulbs, **bulblets**, in *Allium* (Liliaceae family) or *Oxalis* (Oxalidaceae family). These bulblets superficially look like seeds, but close inspection will reveal their layered structure.

SEXUAL PARTS

Flowers are sexual reproductive structures. They are often aggregated into flower clusters, as shown in Fig. 2. Flower clusters sometimes remain with propagules and may help you with identification. A randomly branched flower cluster is a panicle. A **head** is a tight cluster of flowers on a platform. A straight stem with flowers directly on the axis is a spike. A small spike is a **spikelet.** A simple umbel is a cluster of flowers which all arise from a common point. A **compound umbel** consists of simple umbels attached to a common point. You may also see small leaves, called **bracts,** below the flower. Bracts are sometimes used as an identifying feature.

The **pistil,** shown in Fig. 3, is the most important flower part for your identifications. Pistils are commonly urn-shaped. The lower bulbous portion is the **ovary,** and the neck is the **style.** The ovary contains immature seeds. They are attached to the ovary wall by a **funiculus** (plural funiculi), a tube reminiscent of an umbilical cord. Accessory parts, such as **sepals** or **petals**, may remain with the propagules to help you with identification.

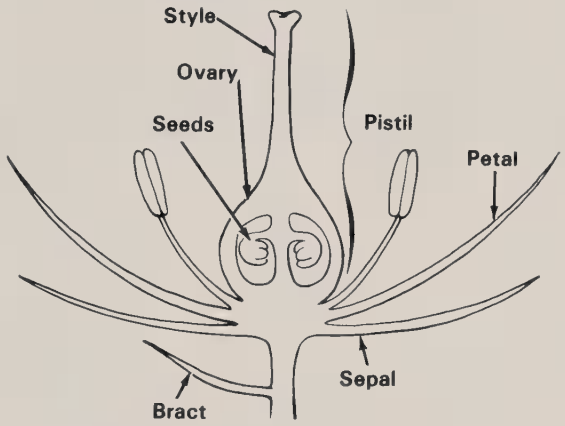


Fig. 3. Flower parts.

FRUITS

The **fruit** is a mature ovary with seeds inside. Sometimes the style, sepals, petals, or bracts remain attached to the fruit. When the fruit falls from its supporting stalk, a fruit scar is formed. You can easily recognize some fruits, such as tomatoes or apples, because the mature ovary wall is fleshy or pulpy and the included seeds are conspicuous and numerous. The style may remain, or may fall to leave a second scar.

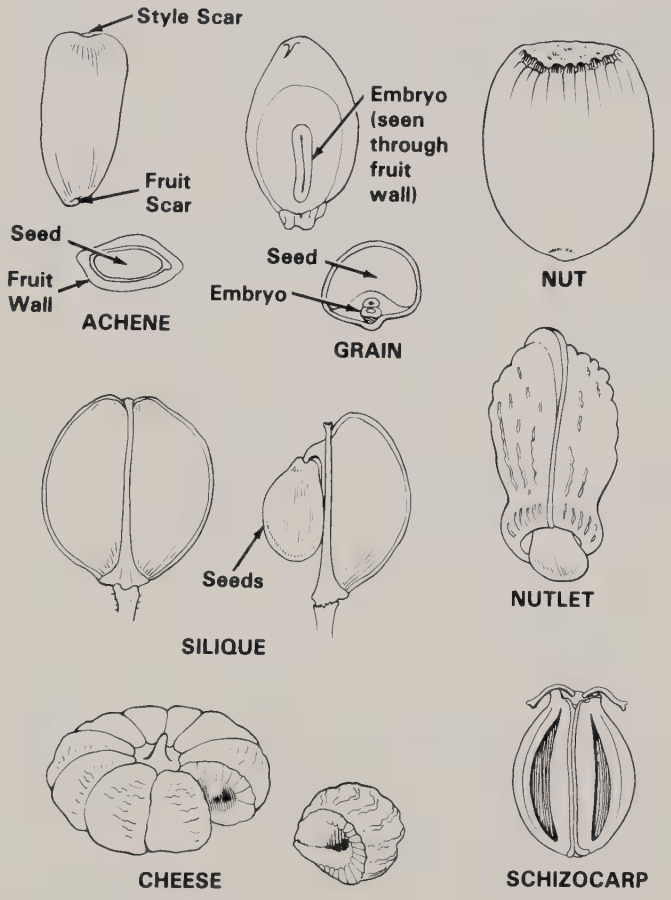


Fig. 4. Types of fruits.

Other fruits are more difficult to recognize, especially when the fruit contains only one seed. Fig. 4 illustrates types of fruit. You are probably familiar with the single-seeded fruit from the sunflower. This type of fruit is called an **achene**. The fruit contains a single free seed inside a hard fruit wall.

A **grain** is restricted to the grass family. This fruit is like an achene, but the seed is firmly fused to all the inside fruit wall. A **nut,** such as the acorn, is an achene with a bony fruit wall. A **nutlet** is a small nut.

A **silique** is restricted to the mustard family. The fruit wall falls away in two halves; this exposes a central papery partition that bears seeds along its margin. A **schizocarp** is restricted to the carrot family. The fruit splits in half, and each half, called **mericarp,** is like an achene. A similiar fruit is in the mallow family. These fruits are called cheeses because they resemble wheels of cheese, and the fruit breaks up into sectoroid subunits resembling cheese wedges.

SEEDS

Within the fruit are one or more seeds. The **seed** consists of three parts (Fig. 5): endosperm, and embryo, and the seedcoat. Endosperm, a food reserve, may or may not be present, but it has no use in seed identification for the purposes of this guide.

The **embryo,** or rudimentary plant, includes root, stem, leaves, and seed leaves (cotyledons). To use the embryo for identification, you usually must dissect the seed, and that is beyond the scope of this guide. In some families, however, you can see the shape of the embryo through the seedcoat, and this can aid in identification. For example, you can sometimes determine the shape of the embryo in the mustard family (Brassicaceae). You also can often see the embryo through the grain coat in grasses.

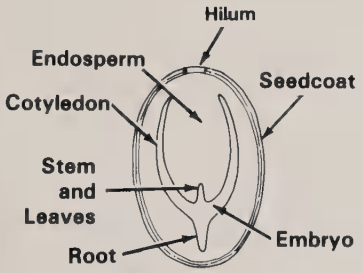


Fig. 5. Seed parts.

The **seedcoat** is the outside shell of the seed, and is a prime identifying feature of the seed. The seedcoat may be plain, shiny, rough, sculptured, winged, hairy, or otherwise ornamented. The color of the seedcoat can also be important to identification.

The seedcoat bears a funicular scar, called a seed scar, or **hilum** (plural hilums or hila). The shape and size of the hilum are identifying features of a seed.

The shape and size of the seed itself are also key identifying features. The shapes used in this guide to describe seeds are illustrated in Fig. 6.

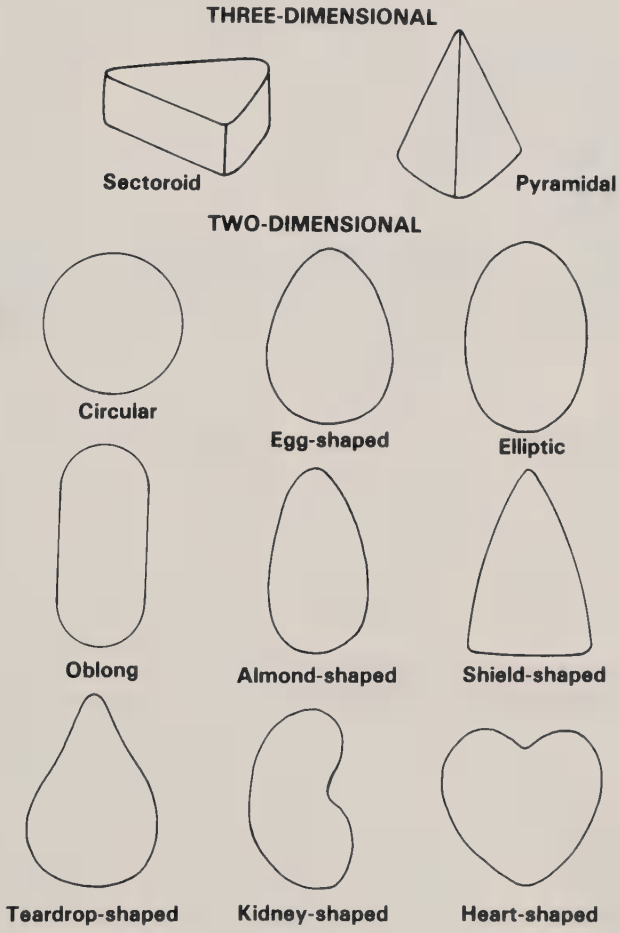


Fig. 6. Basic seed shapes.

FAMILY IDENTIFICATION 3

You can determine the family of an unknown propagule in three ways. First, you can recognize the family on sight. This is fairly easy for a few of the most important and common families given in this guide. The section on Principal Family Recognition gives you tips on how to recognize nine such families.

A second way to determine the family is to note some peculiar feature which you think may be restricted to one or a few families. The section on Quick Aids to Family Recognition describes features you can check.

The third way to identify families is to use the Key to the Families. The key tends to be the most laborious method, but it is the most reliable. When using any of these three methods, remember that all are merely aids to identification, and that you should delay a final decision until you consult the description, photographs, and examples in the Family Catalog.

PRINCIPAL FAMILY RECOGNITION

If you can recognize a few principal families on sight, you will save much time. You can recognize easily most members of the following nine families: Asteraceae, Poaceae, Fabaceae, Apiaceae, Cannabaceae, Amaranthaceae, Caryophyllaceae, Chenopodiaceae, and Portulacaceae. Study the descriptions of these families below and in the Family Catalog so that you can recognize these families on sight. But, when identifying a propagule, always verify your identification using the Family Catalog.

Asteraceae

The sunflower family (Asteraceae) produces achenes (Fig. 7). These are topped by a cluster of hairs, barbs, or spines. These ornaments, sometimes lost during handling, are tinsellate, meaning that they bear small secondary hairs. A style or style scar is centered in the cluster.

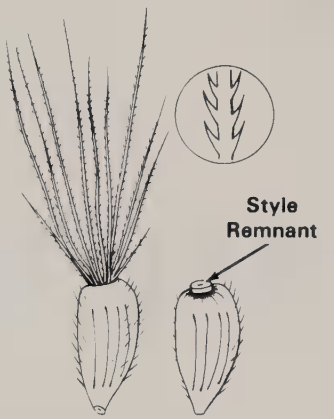


Fig. 7. Asteraceae.

Poaceae

You will need to know how grass flower clusters (Fig. 8) are put together to recognize the grass family (Poaceae). Grass flowers are small and inconspicuous. Each flower is enclosed by an upper (palea) and a lower (lemma) bract. The entire structure is a floret.

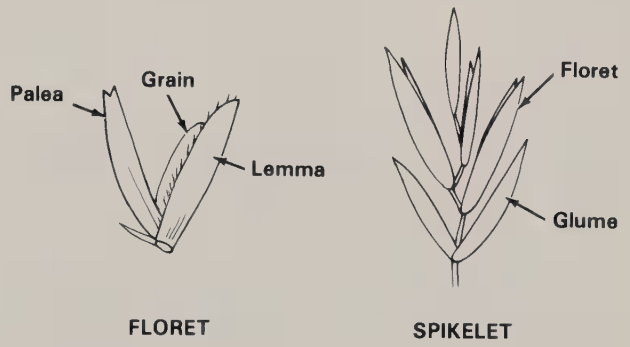


Fig. 8. Poaceae.

The florets are in spikelets subtended by two bracts (glumes). The grain that develops from the grass flower may fall away from the palea and lemma, or it may remain with those two bracts. Sometimes the entire spikelet falls as a unit, and may retain a small bit of stalk. You can generally identify the grass family by these spikelet structures.

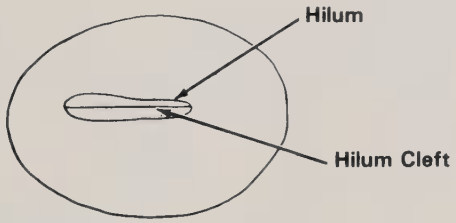
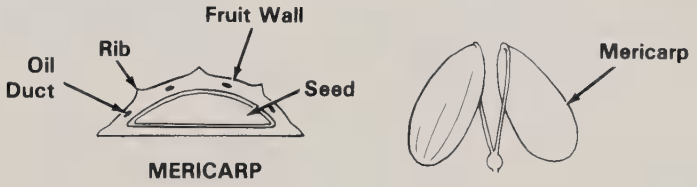


Fig. 9. Faboideae.

Fabaceae

Most of the important members of the legume family (Fabaceae) belong to the pea subfamily (Faboideae). The propagules (Fig. 9) are usually seeds. The hilum has a distinct cleft or line down the middle. In a few members the hilum is obscured by a spongy plug of brittle tissue. These few members include cultivated garden beans.



Apiaceae

The carrot family (Apiaceae) produces schizocarp fruits (Fig. 10) atop compound umbel flower clusters. The actual propagules are halves of the schizocarp, or mericarps, that are like achenes with one flat or concave side and one rounded side. The rounded side has five ribs or wings alternating with dark oil ducts. The fruits often smell spicy or herbal when crushed.

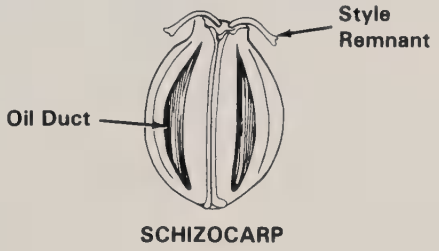


Fig. 10. Apiaceae.

Cannabaceae

The hemp family (Cannabaceae) is recognized by the net-veined fruits (Fig. 11). You will usually see a retained envelope around the fruits.

Remaining Families

The pigweed family (Amaranthaceae) (Fig. 12), carnation family (Caryophyllaceae) (Fig. 13), goosefoot family (Chenopodiaceae), and purslane family (Portulacaceae) are related families with similar seeds. The outward appearance reflects the horseshoe-shaped or coiled embryo. Seeds of Amaranthaceae, Chenopodiaceae, and some Caryophyllaceae and Portulacaceae are often lens-shaped and black with a marginal rim notched at the hilum. Seeds of most Caryophyllaceae and Portulacaceae are kidney-shaped and with parallel sweeping surface sculpture. Differences between these four families are itemized in the family treatments in the Family Catalog.

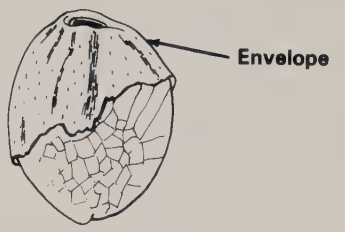


Fig. 11. Cannabaceae.

Fig. 12. Amaranthaceae.

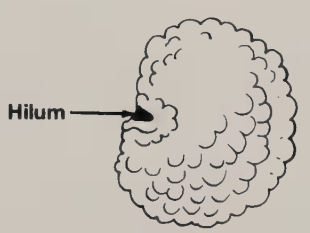


Fig. 13. Caryophyllaceae.

QUICK AIDS TO FAMILY RECOGNITION

The following hints will help you to quickly identify families with unique or uncommon propagule features. If you see on your unknown propagule some feature you think is unusual, check to see if the feature is listed. The list is broken into four major categories: (1) appended structures, such as hairs and remaining fruit parts; (2) surface, including sculpturing, ribs, and surface lines; (3) scar, which includes hila and fruit scars; and (4) shape and size, which includes overall size and general shape.

Appended Structures

Plume of hairs

Hairs bearing regularly spaced minute swellings or knots (Fig. 14)...AMARANTHACEAE

Hairs bearing minute secondary hairs (Fig. 15) ...ASTERACEAE

Hairs without minute structures, all arising from end of seed...ASCLEPIADACEAE

Hairs arising from along persistent style ...RANUNCULACEAE

Hairs arising from bracts...POACEAE

Hairs twisted, matted...MALVACEAE

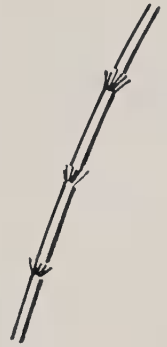


Fig. 14. Amaranthaceae.

Fig. 15. Asteraceae.

Net-veined envelopes...SCROPHULARIACEAE

Envelopes with bifid projecting style (Fig. 16) ...CYPERACEAE

Cap-like fruit tops with two or three prongs associated with seeds (Fig. 17)... AMARANTHACEAE

Surface

Net venation (Fig. 18)...CANNABACEAE

Net sculpturing...SCROPHULARIACEAE

Undulating sculpturing...SOLANACEAE

Transverse ridges and furrows (Fig. 19) ...OXALIDACEAE

Horseshoe-shaped line on faces . . . FABACEAE

Sculpture of irregular polygons with nipple in middle . . . CARYOPHYLLACEAE

Embryo visible on side of fruit...POACEAE

Five ribs or oil ducts...APIACEAE

Scar

Hilum bisected...FABACEAE subfamily FABOIDEAE

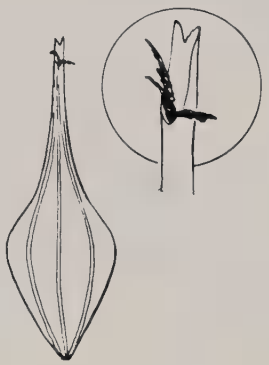


Fig. 16. Cyperaceae.

Fig. 17. Amaranthaceae.

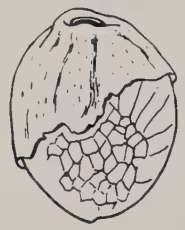


Fig. 18. Cannabaceae.

Fig. 19. Oxalidaceae.

V-shaped...LAMIACEAE

With two nipples

Hilum on end...BORAGINACEAE

Hilum on side, seed oblong... SCROPHULARIACEAE

Hilum on side, seed boat-shaped ...PLANTAGINACEAE

Lateral and propagule not curved

Seed oblong...SCROPHULARIACEAE

Seed boat-shaped...PLANTAGINACEAE

Propagule hemispherical...RUBIACEAE

Surrounded by omega-shaped rim (Fig. 20) ...CONVOLVULACEAE

Fig. 20. Convolvulaceae.

Shape and Size

Seeds small, less than 1 mm

Seeds spindle-shaped or with white cap...JUNCACEAE

Seedcoat covered with transverse rings of ridges...OXALIDACEAE

Seedcoat sculpturing undulating ...SOLANACEAE

Seeds hemispherical...LYTHRACEAE

Seeds dust-like...SCROPHULARIACEAE, CAMPANULACEAE, OROBANCHACEAE

Corkscrew-shaped...FABACEAE

Lens-shaped

Hilum with white plug...PORTULACACEAE

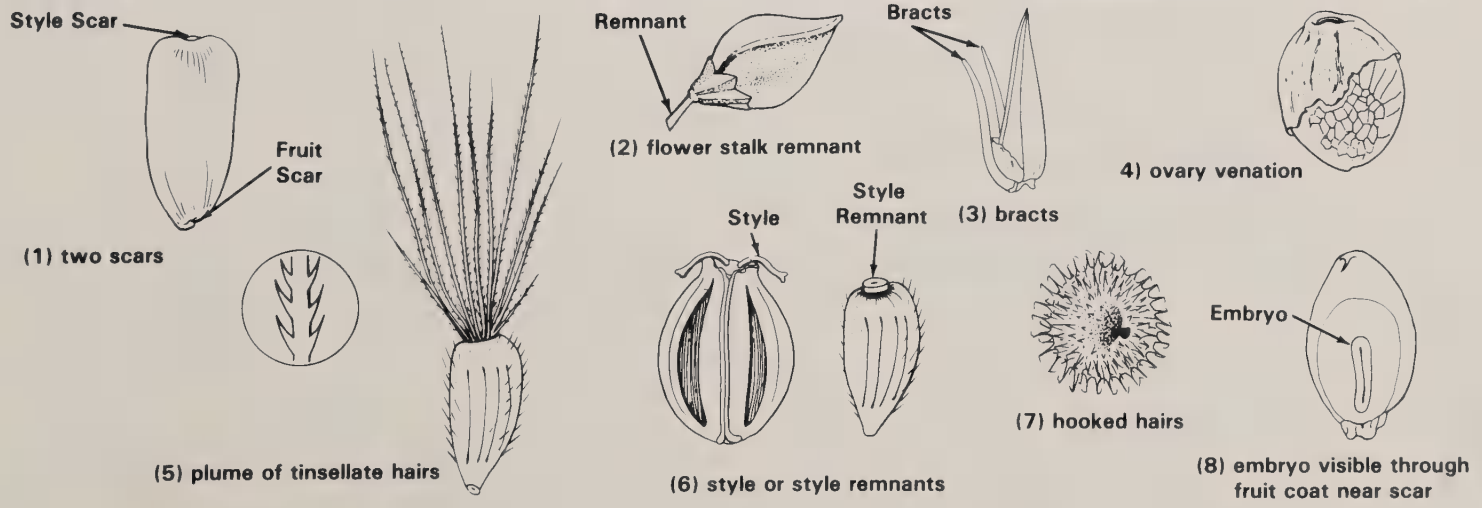
Seeds associated with sharp flower parts ...AMARANTHACEAE

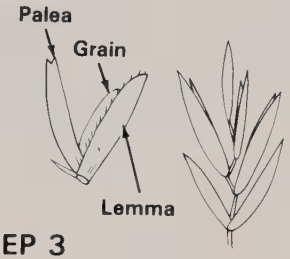
Seeds enveloped with papery envelopes or soft flower parts...CHENOPODIACEAE

KEY TO THE FAMILIES

You can identify an unknown propagule to family using this key. To use the key, start with STEP 1. Each step contains two contrasting descriptions—OPTION A and OPTION B. Compare the propagule you are identifying to each option, and select the option that best describes the propagule. Each option directs you either to another step, or to a family in the Family Catalog. When the key directs you to a family, find that family in the Family Catalog. Use the family description and photographs to verify that the propagule belongs in the family identified in the key.

STEP	OPTION A	OPTION B
1	**A.** Propagules fruits or fruit segments, larger than 0.5 mm, and at least one of the following fruit attributes present (illustrated below): (1) two scars, (2) flower stalk remnants, (3) bracts, (4) ovary venation, (5) plume of tinsellate hairs, (6) style or style remnants, (7) hooked hairs, (8) embryo visible through fruit coat near scar. **GO TO STEP 2**	**B.** Propagules seeds or passing for seeds, without any of the listed fruit attributes. Seeds sometimes smaller than 0.5 mm. **GO TO STEP 27**

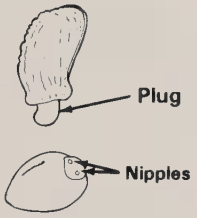


STEP	OPTION A	OPTION B
2 from 1	**A.** Fruit a grain or cluster of grains, with or without bracts above (palea) and below (lemma).  **GO TO STEP 3**	**B.** Fruit not a grain. **GO TO STEP 4**
3 from 2	**A.** Fruit bearing two needle-like bracts on the side, or bearing hairs with regularly spaced minute swellings, fruits not true grains. Try *Achyranthes* or *Trichinum* in  **AMARANTHACEAE**	**B.** Fruit not bearing two needle-like bracts on the side; fruit lacking hairs with regularly spaced swellings. **POACEAE**

STEP	OPTION A	OPTION B
4 from 2	**A.** Propagules composed of united smaller fruits; each smaller fruit with a style scar or remnant. **ROSACEAE**	**B.** Propagules composed of single fruits or fruit segments; each fruit segment lacking an individual style scar or remnant. **GO TO STEP 5**
5 from 4	**A.** Propagules fruit segments with one flat or concave side, or two intersecting flat or concave sides; frequently sectoroid; not equilaterally triangular in cross section. **GO TO STEP 6**	**B.** Propagules equilaterally triangular, lens-shaped, or round in cross section. **GO TO STEP 13**
6 from 5	**A.** Fruit segments with one flat or concave side; if with two flat sides, then fruit segments thirds of whole fruit. **GO TO STEP 7**	**B.** Fruit segments with two flat or concave sides, never thirds of whole fruit. **GO TO STEP 9**

Sectoroid

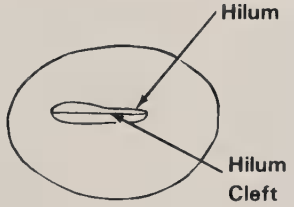
STEP	OPTION A	OPTION B
7 from 6	**A.** Fruit segments thirds of whole fruit. **EUPHORBIACEAE**	**B.** Fruit segments halves of whole fruit. **GO TO STEP 8**
8 from 7	**A.** Back of fruit segments with five ribs or oil ducts.  **APIACEAE**	**B.** Back of fruit segments without five ribs or ducts. **VERBENACEAE**
9 from 6	**A.** Fruit segments narrow wedges. **GO TO STEP 10**	**B.** Fruit segments quarters. **GO TO STEP 11**
10 from 9	**A.** Fruit segments curved, ear-like. **MALVACEAE**	**B.** Fruit segments not curved. **ROSACEAE**

STEP	OPTION A	OPTION B
11 from 9	**A.** Fruit scar small. **ROSACEAE**	**B.** Fruit scar large and obvious. **GO TO STEP 12**
12 from 11	**A.** Fruit scar more or less circular; scar usually topped with plug or two nipples, but sometimes naked; flattening of propagule sides usually indistinct.  **BORAGINACEAE**	**B.** Fruit scar V-shaped; always without plug or two nipples; flattening of propagule sides always distinct. **LAMIACEAE**
13 from 5	**A.** Style remnants and style scar absent. **GO TO STEP 14**	**B.** Style remnants present, at least as a beak or scar. **GO TO STEP 17**
14 from 13	**A.** Fruit with single lens-shaped seed. **CHENOPODIACEAE**	**B.** Fruit a nutlet. **GO TO STEP 15**

STEP	OPTION A	OPTION B
15 from 14	**A.** Fruit scar large; approximately circular. **GO TO STEP 16**	**B.** Fruit scar small; V- or U-shaped. **LAMIACEAE**
16 from 15	**A.** Fruits more than four times longer than broad. **VERBENACEAE**	**B.** Fruits less than four times longer than broad. **BORAGINACEAE**
17 from 13	**A.** Fruit corkscrew-shaped. **FABACEAE subfamily MIMOSOIDEAE** *(Prosopis)*	**B.** Fruit not corkscrew-shaped. **GO TO STEP 18**
18 from 17	**A.** Fruit composed of two approximately equal halves, distinguished by a cleft, line, or ridge. **GO TO STEP 19**	**B.** Fruit not visibly composed of two halves. **GO TO STEP 22**

STEP	OPTION A	OPTION B
19 from 18	**A.** Fruit plump egg-shaped to plump lens-shaped; longitudinal rim surrounding fruit; fruit coat net-veined, or large (ca. 1 cm) net-veined wing attached to fruit. **CANNABACEAE**	**B.** Fruit shape various; fruit coat not net-veined; fruits without net-veined wing. **GO TO STEP 20**
20 from 19	**A.** Each half of fruit with five longitudinal ribs or dark oil ducts. **APIACEAE**	**B.** Each half of fruit without five ribs or oil ducts; ribs and ducts usually lacking altogether. **GO TO STEP 21**
21 from 20	**A.** Fruit divided into two chambers by internal partition; seam of two halves down middle of flat sides or around margin. **BRASSICACEAE**	**B.** Fruit not divided internally; seam of two halves around margin. **FABACEAE subfamily FABOIDEAE**
22 from 18	**A.** Plume of hairs or scales present. **GO TO STEP 23**	**B.** Plume of hairs absent. **GO TO STEP 24**

STEP	OPTION A	OPTION B
23 from 22	**A.** Hairs or scales tinsellate (bearing small secondary hairlets), arising from around the style or style scar. **ASTERACEAE**	**B.** Hairs not tinsellate (bearing small secondary hairlets), arising all along persistent style. **RANUNCULACEAE**
24 from 22	**A.** Fruit more or less conical; five conspicuously flattened scales arising from pointed end; conspicuous style remains at broad end.  **SPARGANIACEAE**	**B.** Fruit shape various; conspicuously flattened scales absent; style present or absent. **GO TO STEP 25**

STEP	OPTION A	OPTION B
25 from 24	**A.** Fruit completely surrounded by papery envelope open and often split at the apex; or long scales or bristles arising from the fruit base; or fruits with persistent thread-like style longer than the fruit; or fruits triangular in cross section and with conspicuous cell patterns on surface (under 25X). **CYPERACEAE**	**B.** Fruit without papery envelope; bristles or scales not arising from fruit base; style not long and thread-like; fruits various shapes in cross section, if triangular then without conspicuous cell patterns. **GO TO STEP 26**
26 from 25	**A.** Fruits triangular with or without sepal cup; or flattened and with persistent sepal cup. **POLYGONACEAE**	**B.** Fruit not triangular; or flattened without sepal cup. **ASTERACEAE**
27 from 1	**A.** Hilum with central cleft or covered with white spongy tissue. Seedcoat not highly sculptured.  **FABACEAE subfamily FABOIDEAE**	**B.** Hilum without central split and without white spongy tissue. Seedcoat sometimes sculptured. **GO TO STEP 28**

STEP	OPTION A	OPTION B
28 from 27	**A.** Seed lens-shaped with marginal rim, or strongly kidney-shaped without conspicuous elongated ridge, or horseshoe-shaped with conspicuous included bent embryo, or globose with visible horseshoe-shaped embryo. **GO TO STEP 29**  (1) lens-shaped with rim  (2) strong kidney shape without ridge  (3) horseshoe-shaped with conspicuous bent embryo  (4) globose with visible horseshoe-shaped embryo	**B.** Seed not curved, not strongly bent, not horseshoe-shaped, not globose with conspicuous included embryo; if kidney-shaped, then with ridge or flap near hilum, or with ridge along the back; sometimes teardrop-shaped. **GO TO STEP 39**  kidney-shaped with ridge
29 from 28	**A.** Seedcoat without decided sculpturing. **GO TO STEP 30**	**B.** Seedcoat with decided sculpturing. **GO TO STEP 35**

STEP	OPTION A	OPTION B
30 from 29	**A.** Seedcoat shiny. **GO TO STEP 31**	**B.** Seedcoat dull. **GO TO STEP 34**
31 from 30	**A.** Seeds with clinging fruit remnants. **CHENOPODIACEAE**	**B.** Seeds without fruit remnants. **GO TO STEP 32**
32 from 31	**A.** Seedcoat with faint surface bulges. Seed lens-shaped to horseshoe-shaped. **GO TO STEP 33**	**B.** Seedcoat without any faint undulations. Seeds lens-shaped with marginal rim. **AMARANTHACEAE**
33 from 32	**A.** Hilum topped by a solid white plug. **PORTULACACEAE**	**B.** Hilum not topped by white plug. **CARYOPHYLLACEAE**

STEP	OPTION A	OPTION B
34 from 30	**A.** Seed with clinging fruit remnants. **CHENOPODIACEAE**	**B.** Seed without clinging fruit remnants. **BRASSICACEAE**
35 from 29	**A.** Plug arises from hilum. **PORTULACACEAE**	**B.** Plug does not arise from hilum; sometimes a flap attached elsewhere covers the hilum. **GO TO STEP 36**
36 from 35	**A.** Seed strongly kidney-shaped. **GO TO STEP 37**	**B.** Seed horseshoe-shaped or globose. **GO TO STEP 38**
37 from 36	**A.** Hilum covered: seedcoat with simple hairs, star-shaped hairs, or other projections. **MALVACEAE**	**B.** Hilum not covered; seedcoat strongly sculptured, but without hairs or star-shaped projections. **CARYOPHYLLACEAE**

STEP	OPTION A	OPTION B
38 from 36	**A.** Seedcoat pitted or rough; seed globose or horseshoe-shaped. **BRASSICACEAE**	**B.** Seedcoat with raised sculpturing; seed horseshoe-shaped. **CAMPANULACEAE**
39 from 28	**A.** Hilum decidedly on side or in concave part of kidney-shaped seeds; never on perimeter of flattened seeds; never on end of elongated seeds. **GO TO STEP 40**	**B.** Hilum or scar at or very near end; or on perimeter of flattened seeds; or obscure. **GO TO STEP 45**
40 from 39	**A.** Seed with conspicuous ridge or line along length, or near hilum. **GO TO STEP 41**	**B.** Seed without conspicuous ridge or line along length. **GO TO STEP 43**
41 from 40	**A.** Ridge bisected by hilum; seed flat; seedcoat with fine sculpturing. **CARYOPHYLLACEAE** *(Dianthus)*	**B.** Ridge not bisected by hilum; seed shape various; seedcoat usually rough-sculptured. **GO TO STEP 42**

STEP	OPTION A	OPTION B
42 from 41	**A.** Ridge distinct from hilum; seed never kidney-shaped. **COMMELINACEAE**	**B.** Ridge with hilum at end; seed sometimes kidney-shaped. **PAPAVERACEAE**
43 from 40	**A.** Hilum large, conspicuous, often with internal marks or protrusions. **GO TO STEP 44**	**B.** Hilum small, inconspicuous, without internal marks or protrusions. **PRIMULACEAE**
44 from 43	**A.** Seeds boat-shaped. **PLANTAGINACEAE**	**B.** Seeds oblong. **SCROPHULARIACEAE** *(Antirrhinum)*
45 from 39	**A.** Seeds 1 mm or less; rarely with a white cap that brings length to 1.2 mm. Not sectoroid. **GO TO STEP 46**	**B.** Seeds longer than 1 mm; or about 1 mm and sectoroid (not 1-1.2 mm and with white cap). **GO TO STEP 53**

STEP	OPTION A	OPTION B
46 from 45	**A.** Seeds spindle-shaped, with a projection on each end; or egg-shaped with a white cap and about 1-1.2 mm. Seedcoat without conspicuous sculpturing. **JUNCACEAE** **(Also check *Ludwigia* in ONAGRACEAE.)**	**B.** Seeds not spindle-shaped; or not about 1.2 mm and with a white cap. Seedcoat with or without conspicuous sculpturing. **GO TO STEP 47**
47 from 46	**A.** Seeds less than 0.5 mm, dust-like. **GO TO STEP 48**	**B.** Seeds 0.5 mm to 1 mm. **GO TO STEP 49**
48 from 47	**A.** Seedcoat smooth or with fine parallel lines. **CAMPANULACEAE**	**B.** Seedcoat rough or net-sculptured. **OROBANCHACEAE AND SCROPHULARIACEAE**

STEP		OPTION B
49 from 47	**A.** Seedcoat sculpturing of annular rings perpendicular to the seed axis.  **OXALIDACEAE**	**B.** Seedcoat sculpturing absent, or net-like, or furrowed parallel to the seed axis. **GO TO STEP 50**
50 from 49	**A.** Hilum surrounded by distinct ridge, or seedcoat with parallel fine lines or smooth. **CAMPANULACEAE**	**B.** Hilum not surrounded by distinct ridge; seedcoat rough or with net-sculpturing. **GO TO STEP 51**
51 from 50	**A.** Seeds hemispherical. **LYTHRACEAE**	**B.** Seeds not hemispherical. **GO TO STEP 52**
52 from 51	**A.** Seedcoat sculpturing netted or longitudinal striations. **SCROPHULARIACEAE**	**B.** Seedcoat sculpturing undulating. **SOLANACEAE**

STEP	OPTION A	OPTION B
53 from 45	**A.** Each side of seed with horseshoe-shaped line or dots. **GO TO STEP 54**	**B.** Seed sides without horseshoe-shaped lines or dots. **GO TO STEP 55**
54 from 53	**A.** Seedcoat with unbroken line or with dots. **FABACEAE subfamily CAESALPINIOIDEAE**	**B.** Seedcoat with line broken at top; without dots. **FABACEAE subfamily MIMOSOIDEAE**
55 from 53	**A.** Hilum surrounded by omega-shaped rim. Seeds frequently sectoroid.  **CONVOLVULACEAE**	**B.** Hilum not surrounded by omega-shaped rim. Seed shape various. **GO TO STEP 56**
56 from 55	**A.** Seedcoat bearing ring-like transverse patterns. **OXALIDACEAE**	**B.** Seedcoat without ring-like transverse patterns. **GO TO STEP 57**

STEP	OPTION A	OPTION B
57 from 56	**A.** Plume or matted hairs present. **GO TO STEP 58**	**B.** Plume or matted hairs absent. **GO TO STEP 60**
58 from 57	**A.** Hairs straight, arising from one end of seed. **GO TO STEP 59**	**B.** Hairs twisted and bent, arising from the entire seedcoat. **MALVACEAE**
59 from 58	**A.** Hairs arising from along persistent style (true fruits). **RANUNCULACEAE**	**B.** Hairs arising from a single point at end of seed; style absent. **ASCLEPIADACEAE**
60 from 57	**A.** Hilum large, about half the seed diameter, with erect raised plug or two smaller nipples, or V-shaped; seeds frequently sectoroid (true fruits). **GO TO STEP 61**	**B.** Hilum smaller, usually without any plug; not V-shaped; seed shape various. **GO TO STEP 62**

STEP	OPTION A	OPTION B
61 from 60	**A.** Hilum V-shaped. **LAMIACEAE**	**B.** Hilum round or oval, with a single raised plug or two smaller nipples. **BORAGINACEAE**
62 from 60	**A.** Seed flattened, teardrop-shaped, if (occasionally) triangular then with line down flat side. **GO TO STEP 63**	**B.** Seed not teardrop-shaped, if triangular then without line down side. **GO TO STEP 64**
63 from 62	**A.** Margin piped. **CUCURBITACEAE**	**B.** Margin not piped, sometimes flattened. **ASCLEPIADACEAE**
64 from 62	**A.** Seedcoat net-sculptured; seed never winged. **GO TO STEP 65**	**B.** Seedcoat not net-sculptured; seed sometimes winged. **GO TO STEP 67**

STEP	OPTION A	OPTION B
65 from 64	**A.** Seeds with a prominent ridge along one side; sometimes with a low remnant near the hilum; sometimes kidney-shaped. **PAPAVERACEAE**	**B.** Seeds without ridge; without a funicular remnant; not kidney-shaped. **GO TO STEP 66**
66 from 65	**A.** Seeds not cubical. **SCROPHULARIACEAE**	**B.** Seeds cubical. **SOLANACEAE**
67 from 64	**A.** Seeds slightly asymmetrical or a hollow sphere; frequently covered with scales or warts; wingless. **ACANTHACEAE**	**B.** Seeds not asymmetrical, or if asymmetrical, then with a wing to one side; not a hollow sphere; not covered with scales or warts. **GO TO STEP 68**
68 from 67	**A.** Cartilage-like protrusion near hilum. **EUPHORBIACEAE**	**B.** Cartilage-like protrusion absent. **GO TO STEP 69**

STEP	OPTION A	OPTION B
69 from 68	**A.** Seed with prominent wing to one side. **LYTHRACEAE**	**B.** Seed wingless. **GO TO STEP 70**
70 from 69	**A.** Seeds more or less pyramidal; sometimes with a lighter portion capped by a darker portion. **GO TO STEP 71**	**B.** Seeds not pyramidal; never separated into dark and light portions. **GO TO STEP 72**
71 from 70	**A.** Seeds slightly asymmetrical, or separated into light and dark portions. **ONAGRACEAE**	**B.** Seeds symmetrical; never separated into dark and light portions. **LYTHRACEAE**
72 from 70	**A.** Seeds irregularly polygonal, or seedcoat with bubble-like or seaweed-like sculpturing. **PRIMULACEAE**	**B.** Seeds not irregularly polygonal; seedcoat sculpturing not bubble-like or seaweed-like. **GO TO STEP 73**

STEP	OPTION A	OPTION B
73 from 72	**A.** Seeds flattened; approximately circular. **GO TO STEP 74**	**B.** Seeds not flattened and circular. **CAMPANULACEAE**
74 from 73	**A.** Seed face bisected by small line. **LYTHRACEAE**	**B.** Seed face without line. **SOLANACEAE**

FAMILY CATALOG 4

The families in this catalog are listed alphabetically by scientific names. Alternate scientific names and common names are listed also. The treatment of each family includes a description of the propagule or propagules likely to be encountered, a few notes on the family, a list of important members, and color photographs of selected propagules. Note that the descriptions, where possible, are organized identically for each family: first, the type and shapes of the propagule; second, the coat; and third, the scar.

Use the catalog to verify the family of a propagule after you have used one of the three methods in Family Identification to identify the family.

SCALE OF PHOTOGRAPHS

All of the group photographs of propagules are 1.2 times actual size. The photographs of individual propagules, however, vary in magnification. Therefore, a millimeter scale below each photograph indicates the magnification of the propagule. The length between each calibration equals 1.0 mm.

ACANTHACEAE, acanthus family

PROPAGULE

Seed, flat, with outline circular, slightly asymmetrically oblong, heart-shaped, egg-shaped, or shield-shaped; perimeter sometimes coarsely scalloped; occasionally an approximate hollow sphere *(Thunbergia)* with pore leading to the cavity and internal hilum. **Seedcoat** usually covered with mealy projections, spongy or warty layer, scales, or a satin-like layer of hairs; rarely without any covering; tan to black. **Hilum** outline irregular, marginal in flattened seeds, at side or slightly to one side of the apex in elongate seeds, sometimes in a small notch or depression.

Seeds of many species are suspended by enlarged curved clasping funiculi which extend from a central column of the fruit.

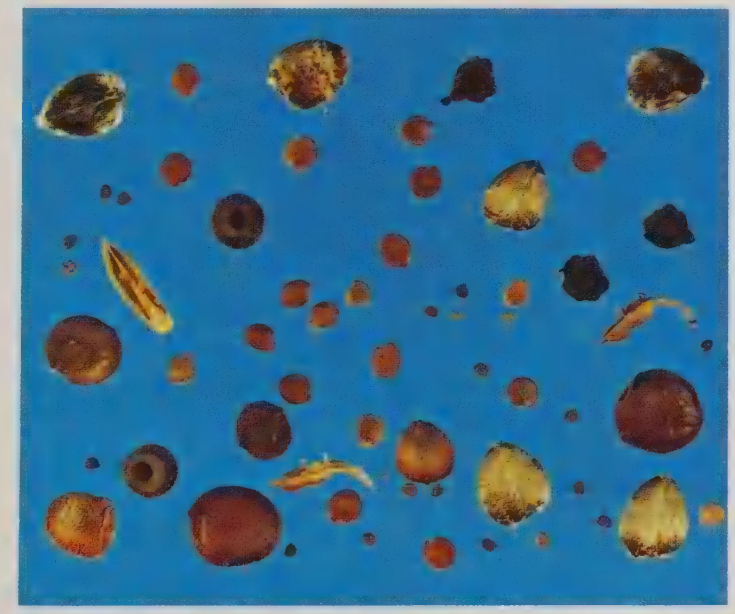
FAMILY IMPORTANCE AND DISTRIBUTION

Mostly pantropical herbs or shrubs. A few species are ornamental plants.

IMPORTANT MEMBERS

Acanthus. Acanthus; bear's breath. Ornamentals.
Beloperone. Shrimp plant. Ornamental.
Thunbergia alata. Black-eyed Susan. Ornamental.

ACANTHACEAE



AMARANTHACEAE, pigweed family

PROPAGULE

Seed, lens-shaped, usually with distinct marginal rim notched at the hilum; rarely globose *(Bosea)* or heart-shaped. **Seedcoat** black, shiny, and smooth; rarely straw-colored in immature seeds. **Hilum** small. Seeds frequently accompanied by flower cluster remains, especially sharp stiff bracts and sepals, and fruit tops with two or three persistent styles.

Fruits with associated sepals and sometimes bracts are the disseminules in *Froelichia* (fruits soft and cotton ball-like), *Achyranthes* (fruits hairless, and with sharp hard sepals and two sharp prong-like bracts), and *Trichinum* (fruits with hard long sepals and bracts covered with long straight hairs bearing regularly spaced minute swellings).

The dominant family members, *Acnida, Amaranthus,* and *Celosia,* have uniformly lens-shaped, black, shiny seeds, which are similar to those of Chenopodiaceae. Amaranthaceae generally have associated sharp bracts and sepals; the Chenopodiaceae generally have soft blunt bracts and sepals.

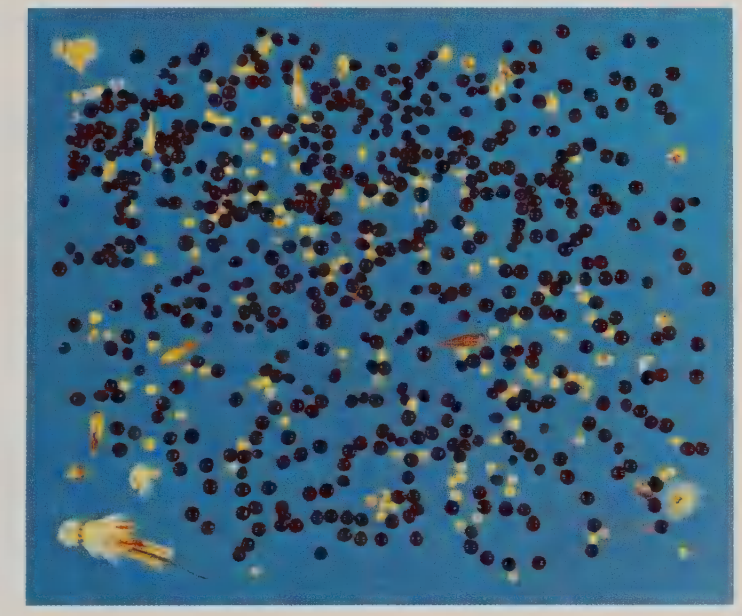
FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan herbs and shrubs. The family contains a few ornamentals and bad weeds.

IMPORTANT MEMBERS

Acnida. Water hemp. Common weeds.
Amaranthus. Pigweeds. *A. hybridus* and *A. spinosus* are serious world weeds.
Celosia cristata. Cockscomb. Ornamental.
Gomphrena globosa. Everlasting. Ornamental.
Iresine. Iresine. Bedding plant.

AMARANTHACEAE



Amaranthus hybridus

Achyranthes aspera

APIACEAE (UMBELLIFERAE), carrot family

PROPAGULE

Mericarp with variable shape, often flattened and elliptic to egg-shaped, or plump to almost hemispherical, or elongate-cylindrical; one side usually flattened or concave. Fruit **coat** bearing five ribs which are often expanded into prominent wings sometimes bearing barbs, prickles, hairs, warts, or scales; ribs rarely inconspicuous; oil ducts between ribs frequently visible as dark lines. Fruit **scar** basal, inconspicuous. Sepals and swollen style frequently persistent at apex of mericarp.

The entire fruit (schizocarp) generally splits into two one-seeded parts (mericarps) that are described above. Most of the fruits in this family have a spicy or herbal odor when crushed.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly aromatic temperate herbs. The family is among the best known of all flowering plants because of the unique compound umbel flower cluster, unique fruit type, and use to man as spices, poisons, medicines, and vegetables.

IMPORTANT MEMBERS

Angelica. Angelica. Flavoring plants.

Anethum graveolens. Dill. Spice.

Carum carvi. Caraway. Fruits used for spice.

Cicuta maculata. Water hemlock. A poisonous plant.

Conium maculatum. Poison hemlock. The poisonous plant that killed Socrates.

Coriandrum sativum. Coriander. A spice.

Cuminum cyminum. Cumin. A spice.

Daucus carota. Carrot. Vegetable.

Foeniculum vulgare. Fennel. Flavoring herb and ornamental.

Heracleum. Cow parsnip and giant hogweed. Pasture weeds.

Pastinaca sativa. Parsnip. A garden vegetable.

Petroselinum hortense. Parsley. A culinary ornament.

Pimpinella anisum. Anise. A flavoring plant.

APIACEAE

Angelica scabrida

ASCLEPIADACEAE, milkweed family

PROPAGULE

Seed typically teardrop-shaped to oval or egg-shaped and strongly flattened with conspicuous marginal rim and plume of long, silky, stiff, smooth-surfaced, white hairs attached to truncate apex; rarely elongate and rarely only slightly flattened. **Seedcoat** straw-colored to brown or dull black; one face with ridge from apex to midpoint or nearly opposite end, terminating in a swollen portion. **Hilum** at narrow end; minute; just below tuft of hairs.

The winged margin is frequently broken and partially or completely missing. The plume of hairs is easily lost as a unit during handling, leaving a distinct light triangular or lens-shaped scar at the seed apex.

Fruits of some Ranunculaceae and Asteraceae are similarly tufted with hairs. They can be distinguished from the seeds of Asclepiadaceae by characters given in treatments of those families.

The Apocynaceae, the closely related dogbane or oleander family, have similarly tufted seeds and similar fruits which open along a single longitudinal slit.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly tropical and subtropical perennial herbs to shrubs, climbers or trees of South America and southern Africa. The family includes some troublesome weeds and livestock poisoners, as well as ornamentals, and folk medicines.

IMPORTANT MEMBERS

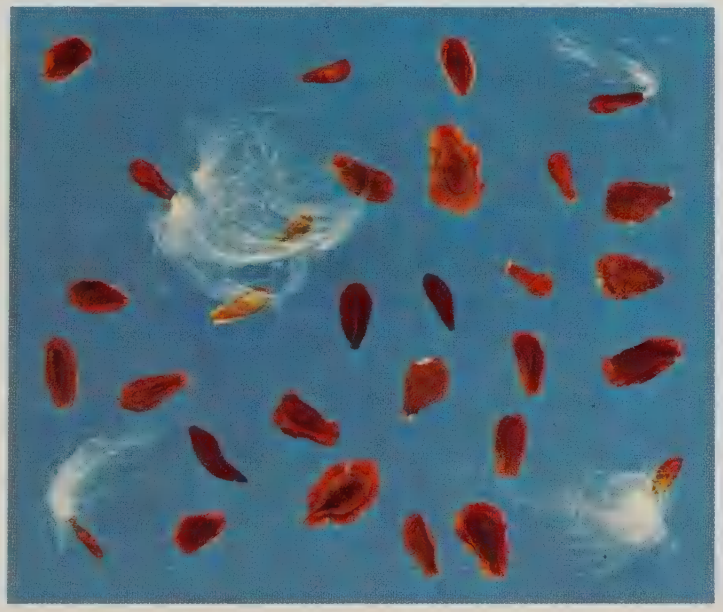
Asclepias. Milkweed. Common weeds with milky juice. Some species are poisonous to livestock.

Hoya carnosa. Wax plant. Tropical vine used as house plant.

Morrenia odorata. Stranglevine. It spreads into citrus groves, girdles and kills branches, shades trees and reduces flower and fruit production. Plants found in Florida.

Stapelia. Starfish-flower or stapelia. Succulent house plants with putrid-smelling flowers.

ASCLEPIADACEAE



Asclepias syriaca

ASTERACEAE (COMPOSITAE), sunflower family

PROPAGULE

Achene shield-shaped to elongate; straight or slightly curved or rarely coiled; cross section round, angled, or triangular flattened. Fruit **coat** smooth or slightly roughened, longitudinally furrowed, winged, or ribbed; variously colored. Fruit **scar** conspicuous at one end and conspicuous style scar at the other. Sepals (pappus) of spines, elongate scales, bristles, or tinsellate hairs, which arise from a slightly raised crown around the style scar; pappus sometimes absent or lost during handling.

Achenes of Asteraceae are easily distinguishable from those of most other families. The plumose achenes occasionally resemble seeds of Asclepiadaceae and Apocynaceae, but the achenes have a fruit scar on the end opposite the plume, have the plume attached at the often larger style end, and have tinsellate (with small secondary hairlets) plume hairs.

A few propagules of Asteraceae are regularly accompanied by head parts or are surrounded by hardened persistent bracts (e.g. *Ambrosia,* the ragweeds). Identification of some of these peculiar propagules can only be made on an individual basis and is beyond the scope of this guide.

FAMILY IMPORTANCE AND DISTRIBUTION

Large, common, variable, and cosmopolitan family of herbs, shrubs, and a few trees. About 25,000 species, or one-tenth of all flowering plants belong in the family. There are a few crop plants, many bad weeds, many ornamentals, and some medically important members.

IMPORTANT MEMBERS

Ambrosia. Ragweeds. Primary contributor to hayfever.
Anthemis nobilis. Chamomile. Folk medicine.
Artemisia dracunculus. Tarragon. A leaf spice.
Aster. Aster. Ornamentals and weeds.
Bellis perennis. Daisy. Lawn weeds.
Bidens. Beggarticks. Weeds and ornamentals.
Calendula. Marigold. Ornamentals.
Carthamus oxyacantha. Wild safflower. Herbaceous, spiny-leaved annual weed in India and Pakistan.
Carthamus tinctorius. Safflower. Oilseed plant.
Chrysanthemum. Chrysanthemum. Ornamentals.
Cichorium endivia. Endive. Spice and salad green.

Cirsium. Thistles. Common pasture weeds.
Crupina vulgaris. Bearded creeper. A vigorous herbaceous winter annual, unpalatable to livestock. It is dominant in some northern California and Idaho rangeland.
Cynaria scolymus. Artichoke. Flower heads eaten as vegetable.
Dahlia. Dahlia. Ornamentals.
Eupatorium. Boneset. Ornamentals and weeds.
Helianthus annuus. Sunflower. Oilseed plant.
Lactuca sativa. Lettuce. Salad green.
Mikania cordata. Mile-a-minute. Aggressive herbaceous perennial vine of tropics. It produces plant inhibitors of nitrification.
Mikania micrantha. Mile-a-minute. Vigorous creeping or twining perennial vine of damp lowland clearings in South and Central America.
Parthenium argentatum. Guayule. Source of rubber precursors.
Senecio. Senecio or old man. Ornamentals.
Solidago. Goldenrod. Ornamentals and showy weeds.
Sonchus oleraceus. Sow thistle. A weed.
Taraxacum officinale. Dandelion. Lawn weeds.
Xanthium. Cocklebur. Weeds with spiny fruits.
Zinnia. Zinnia. Ornamentals.

BORAGINACEAE, forget-me-not family

PROPAGULE

Nutlets four, two, or rarely one per ovary; approximately globose or three-dimensionally egg-shaped, often with one or two flat sides. Nutlet **coat** smooth, roughened, warty, or bearing hooked or plain bristles; dull to shiny; usually black to brown, occasionally white. Nutlet **scar** often conspicuous and large; frequently with an erect plug or two nipples.

Propagule type in Boraginaceae is highly variable and makes good description difficult. The nutlets described above are fairly easy to recognize. They consist of sectoroid ovary segments resembling quarters of an apple or of a pear, with some ornament and a conspicuous fruit scar. Propagule types of two or one segments or propagules of fleshy fruits are difficult to describe at general family level. The four-nutlet fruits are like those in the related Lamiaceae.

FAMILY IMPORTANCE AND DISTRIBUTION

Temperate and subtropical herbs, shrubs and trees. Center of distribution is in Mediterranean. The family includes a few weeds and ornamentals.

IMPORTANT MEMBERS

Alkanna tinctoria. Alkanet. Natural dye for food and industry.

Borago officinalis. Borage. Garden ornamental.

Heliotropium. Heliotrope. Ornamentals and weeds.

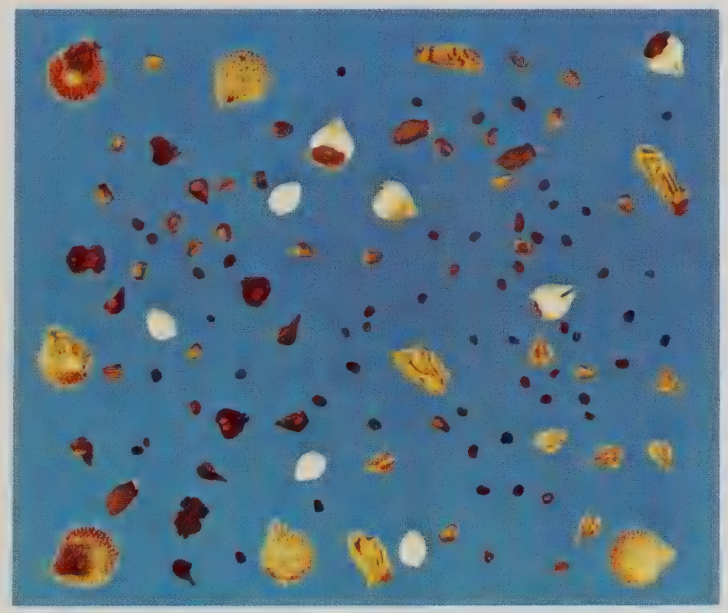
Lappula echinata. Stickseed. Weeds with nutlets that stick like burs.

Mertensia. Bluebells. Garden ornamentals and attractive pasture weeds.

Myosotis. Forget-me-not. Ornamentals.

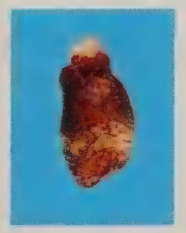
Pulmonaria officinalis. Lungwort. Ornamentals and folk medicine.

BORAGINACEAE



Lithospermum carolinense

Alkanna lutea



BRASSICACEAE (CRUCIFERAE), mustard family

PROPAGULE

Seed of two types: (1) flattened, orbicular to almond-shaped, sometimes with nearly complete marginal wing, notched or cleft usually with a groove of line between the outwardly visible cotyledons and embryonic root, or (2) globose. **Seedcoat** minutely netted, pitted, warty, or wrinkled; black, brown, yellow, or white. **Hilum** inconspicuous, at apex in flattened seeds.

The U-shaped or coiled embryo is often visible, at least in faint general form, through the seed coat of both flattened and globose seeds.

Sometimes the propagule is a silique segment, or an entire small, usually round to egg-shaped silique containing one seed. Fruit parts are frequently associated with seeds of wild or weedy species, and aid family identification.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan, but primarily north temperate herbs, rarely shrubs, with center of distribution in Mediterranean. Brassicaceae include vegetable and oilseed crops, ornamentals, and weeds.

IMPORTANT MEMBERS

Alyssum. Basket of gold. Ornamentals and weeds.

Armoracea. Horseradish. A condiment.

Barbarea. Rockets. Ornamentals and weeds.

Brassica oleracea. Cabbage, kale, kohlrabi, brussel sprouts, broccoli, cauliflower.

Brassica. Turnip, oilseed rape, mustard. Garden vegetables, oilseed plants, condiments, and weeds.

Capsella bursa-pastoris. Shepherd's purse. Common weed.

Iberis amara. Candytuft. Bedding plant.

Lepidium. Pepperweed. Common weeds.

Nasturtium officinale. Watercress. Salad green.

Raphanus sativus. Radish. Garden vegetable.

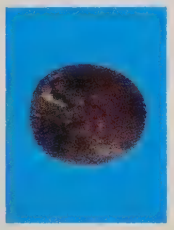
Thlaspi. Pennycress. Common weeds.

BRASSICACEAE

Camelina sativa

Brassica campestris

Brassica juncea



CAMPANULACEAE, bluebell family

PROPAGULE

Seed small, usually 0.2-0.5 mm long, rarely to 3.5 mm; globose, lens-shaped, almond-shaped, or cylindrical-elongate, sometimes with small marginal wing. **Seedcoat** smooth, minutely scaled, or patterned; black, brown, or light honey color. **Hilum** terminal and inconspicuous.

Seeds have few obvious striking characters, and they are very small.

FAMILY IMPORTANCE AND DISTRIBUTION

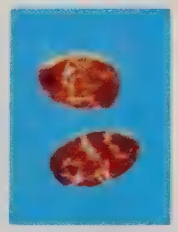
Mostly north temperate herbs. A few are ornamentals, and there is at least one weed.

IMPORTANT MEMBERS

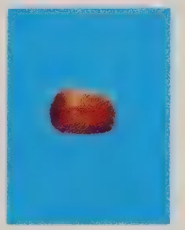
Campanula. Bluebells or bellflowers. Ornamentals.
Lobelia cardinalis. Cardinal flower. An ornamental.
Platycodon. Balloon flower. An ornamental.
Sphenoclea zeylanica. Gooseweed. A rice weed, sometimes assigned to a segregate family, the Sphenocleaceae.

CAMPANULACEAE

Campanulata alata



Campanumaea inflata



Spectacularia speculum

CANNABACEAE, hemp family

PROPAGULE

Achene plump egg-shaped. Fruit **coat** tan-yellow to brown. Fruit **scar** conspicuous, circular, at center of slightly to decidedly raised area.

The two genera of the family have distinct fruits. Achenes of *Cannabis* are slightly flattened, and fruit coats have conspicuous net venation with two large veins at opposite sides spanning from one end to the other. The fruit is surrounded sometimes by a tightly adhering sheath formed from flower part remnants. The sheath is coarsely mottled with light and dark areas. In cultivated forms, the sheath may be present only as some broken remnants around the fruit scar. Fruits of *Humulus* differ by greater flattening, less conspicuous venation, and frequent presence of large wing-like envelopes around the achenes.

FAMILY IMPORTANCE AND DISTRIBUTION

Widely distributed and cultivated plants used for narcotics, fiber, and brewing agents.

IMPORTANT MEMBERS

Cannabis sativa. Marihuana and hemp. Drug and fiber plants.

Humulus lupulus. Hops. Vines which produce lupulin for the brewing industry.

CANNABACEAE

Cannabis sativa

CARYOPHYLLACEAE, carnation family

PROPAGULE

Seed usually kidney-shaped, almond shaped, or teardrop-shaped; plump or flattened; sometimes globose or lens-shaped with rim or prominent marginal wing. **Seedcoat** generally warty, covered with star-like projections, or finely netted, rarely smooth. **Hilum** lateral in a notch or depression in kidney-shaped seeds, or lateral in middle of one side of flattened seeds.

Propagule may be a single-seeded fruit in rare species.

Seeds of Caryophyllaceae are often similar to those of the closely related family Portulacaceae. These two families, and the more distantly related families Chenopodiaceae and Amaranthaceae have strongly U-shaped or coiled embryos which are apparent in external view. Some seeds of Caryophyllaceae are lens-shaped and shiny black with a distinct rim, and almost indistinguishable from some Amaranthaceae. In all but a few instances, fine surface patterns will distinguish the Caryophyllaceae.

The seeds are also similar to those of Papaveraceae. Papaveraceae seeds are usually less coiled or kidney-shaped, and have netted rather than sweeping patterns of sculpturing.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly temperate herbs. Center of distribution is Mediterranean and adjacent Europe and Asia. The family includes garden ornamentals and cosmopolitan weeds.

CARYOPHYLLACEAE

IMPORTANT MEMBERS

Agrostemma githago. Corn cockle. A common weed in grain.

Cerastium. Mouse-ear chickweed. Common garden and lawn weeds.

Dianthus caryophyllus. Carnation. An ornamental.

Dianthus. Pinks. Common garden ornamentals.

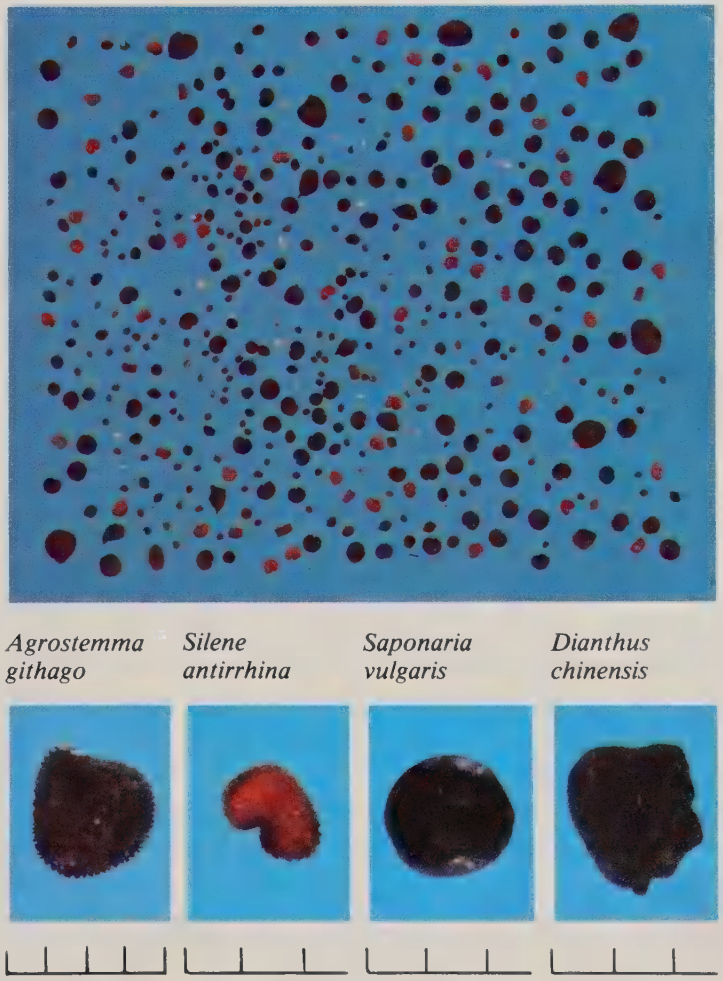
Drymaria arenarioides. Alfombrilla or lightening-weed. Poisonous perennial, lethal to cattle. Not reported in the United States, but native to Mexico and spreading towards the U.S. border.

Lychnis. Campions. Garden plants and common weeds.

Saponaria officinalis. Bouncing bet. A common weed and ornamental.

Silene. Catchfly. Cultivated plants and bad weeds.

Stellaria. Chickweed. Common garden and lawn weeds.



CHENOPODIACEAE, goosefoot family

PROPAGULE

Achene with or without a retained calyx; often tightly surrounding the seed, or flattened and purse-like with mealy hairs or wooly hairs or spines. Seed often easily removed by rubbing between the fingers.

Seed lens-shaped and notched or kidney-shaped. **Seedcoat** minutely sculptured or smooth; dull or shiny; usually black or brown; often obscured by fruit wall remnants. **Hilum** small, near a marginal notch.

Fruit type is highly variable, and may include winged fruits or clusters of individual fruits *(Beta)*. Some fruits have spines at the apex which resemble the pappus of Asteraceae; however, Chenopodiaceae spines lack the small secondary hairs present on Asteraceae spines. Chenopodiaceae seeds sometimes closely resemble those of Amaranthaceae or Caryophyllaceae, but Chenopodiaceae seeds often retain fruit wall remnants.

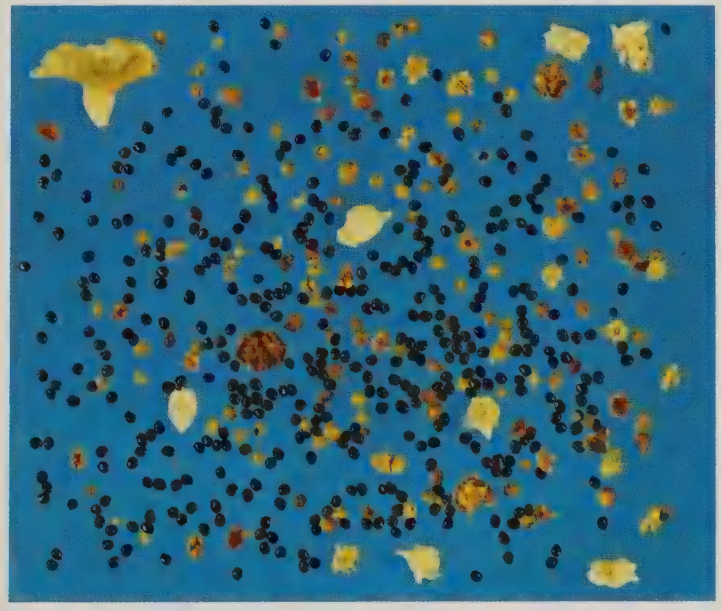
FAMILY IMPORTANCE AND DISTRIBUTION

Temperate or subtropical herbs or shrubs especially of salty or alkaline soils.

IMPORTANT MEMBERS

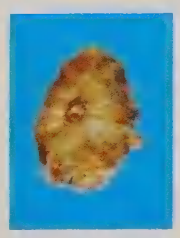
Atriplex. Saltbush. Weeds.
Beta vulgaris. Beet. Vegetable and sugar plant.
Chenopodium album. Lamb's quarters. A common weed.
Kochia scoparia. Kochia. A common weed.
Salsola kali. Russian thistle. A weed.
Spinacia oleracea. Spinach. A vegetable and salad green.

CHENOPODIACEAE



Dondia depressa

Kochia scoparia



Atriplex nuttallii

Chenopodium album

COMMELINACEAE, spiderwort family

PROPAGULE

Seed squat barrel-shaped, globose, or flattened egg-shaped. **Seedcoat** usually conspicuously honeycomb-sculptured, pitted or warty, with longitudinal ridge on side; usually dark colors. **Hilum** covered with shallow pad topped by abrupt nipple-like structure.

FAMILY IMPORTANCE AND DISTRIBUTION

Tropical to subtropical herbs of moist regions. Includes some ornamentals and at least one bad weed.

IMPORTANT MEMBERS

Commelina. Commelina. Ornamentals.

Commelina benghalensis. Benghal dayflower. Herbaceous creeping annual or perennial which successfully competes in crops and pastures. Sometimes used in horticulture.

Rhoeo. Moses in the cradle. An ornamental.

Tradescantia. Wandering jew or spiderwort. Ornamentals.

Zebrina. Wandering jew. Ornamentals.

COMMELINACEAE

CONVOLVULACEAE, bindweed family

PROPAGULE

Seed generally sectoroid, rarely elongate to globose. **Seedcoat** smooth to slightly sculptured; hairless or bearing long or short hairs, sometimes arranged in a distinct plume of long hairs at the end opposite the hilum; dark colors. **Hilum** large and circular, almost terminal on the angled side; often surrounded by a raised omega-shaped border.

FAMILY IMPORTANCE AND DISTRIBUTION

Annual or perennial herbs, often twiners, from temperate and tropical regions. The family includes a few weeds, vegetable plants, and ornamentals.

IMPORTANT MEMBERS

Convolvulus. Bindweeds. Common weeds.
Cuscuta. Dodder. Nonphotosynthetic parasitic plants on crops and other beneficial plants. The genus is sometimes included in its own family, the Cuscutaceae.
Ipomoea batatas. Sweet potato. A starch crop.
Ipomoea purpurea. Morning glory. An ornamental.

CONVOLVULACEAE

Ipomoea batatas

CUCURBITACEAE, pumpkin family

PROPAGULE

Seed flattened, teardrop-shaped, pointed at the hilum end, uncommonly elongate or irregular in outline, often with one or two shoulder-like bulges on each side of the hilum. **Seedcoat** smooth, rarely rough, with or without a thickened margin; sometimes slightly winged at margin; rarely covered with short hairs; light or dark colors or mottled. **Hilum** inconspicuous.

Seeds sometimes are covered with a papery deposit of the fruit wall. Seeds of *Luffa* have two peculiar eyebrow-like bulges on one side near the hilum end.

The fruits are sometimes the propagule. They look like modified cucumbers, gourds, and melons.

FAMILY IMPORTANCE AND DISTRIBUTION

Climbers of moist to moderately dry areas. The family includes melons and related agricultural plants.

IMPORTANT MEMBERS

Citrullus lanatus or *C. vulgaris.* Watermelon, citron. Vegetables.

Cucumis melo. Melon and cantaloupe. Vegetables.

Cucurbita pepo. Pumpkin, squashes and ornamental gourds. Vegetables and garden novelties.

Lagenaria siceraria. Bottle gourd. Natural source of containers and utensils.

Luffa cylindrica. Luffa gourd. Source of luffa sponges and filters.

CUCURBITACEAE

CYPERACEAE, sedge family

PROPAGULE

Achene naked, or surrounded by papery envelope *(Carex)* or bristles or scales; egg-shaped or teardrop-shaped in side view, flattened to triangular in cross-section; apical beak often present. Fruit **coat** smooth to slightly roughened or patterned. Fruit **scar** basal, small.

Flower cluster parts, many times still in intact small spikes, frequently associated with the achenes. The largest genus of the family, *Carex,* has a peculiar papery envelope, the open top of which often exposes withered stigmas.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan grass-like plants. Important as weeds, some ornamentals and foods.

IMPORTANT MEMBERS

Carex. Sedges. The largest genus in the family, common plants in moist areas.

Cyperus esculentus. Rush nut or yellow nutsedge. The tubers are used for food, and the species is weedy.

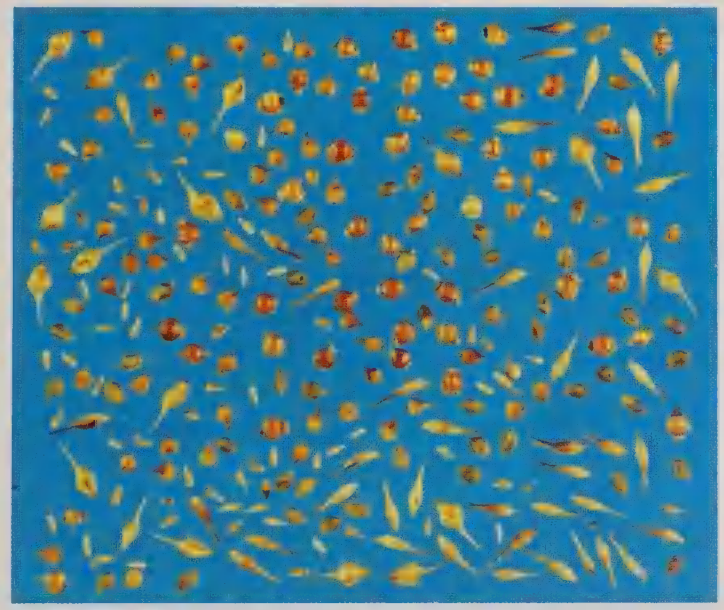
Cyperus papyrus. Papyrus. A natural paper plant.

Cyperus rotundus. Purple nutsedge. Probably the most troublesome weed, worldwide.

Eleocharis tuberosa. Water chestnut. A food.

Scirpus validus. Bulrush. A common marsh plant and fiber plant for mats, baskets, etc.

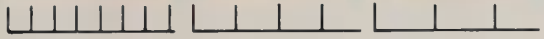
CYPERACEAE



Carex pseudocyperus

Eleocharis dulcis

Cyperus erythrorhizos



EUPHORBIACEAE, spurge family

PROPAGULE

Seed egg-shaped to elliptic, sometimes sectoroid. **Seedcoat** smooth or rough, pitted, or patterned; dull or shiny with a longitudinal groove on one surface; color various, commonly mottled. **Hilum** near end, on side with longitudinal groove; often surrounded by a cartilaginous knot.

Most of the seeds can be readily identified by the longitudinal groove and cartilaginous knot near the hilum; however, the family is large, and seeds of some members vary considerably from the norm. Also, the propagules are sometimes fruit segments, derived from three-part ovaries.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly tropical herbs, shrubs, and trees. Some weeds, ornamentals, and food plants.

IMPORTANT MEMBERS

Aleurites. Tung oil plant. Oil for paints and varnishes.

Euphorbia. Spurges. Common weeds and a few ornamentals.

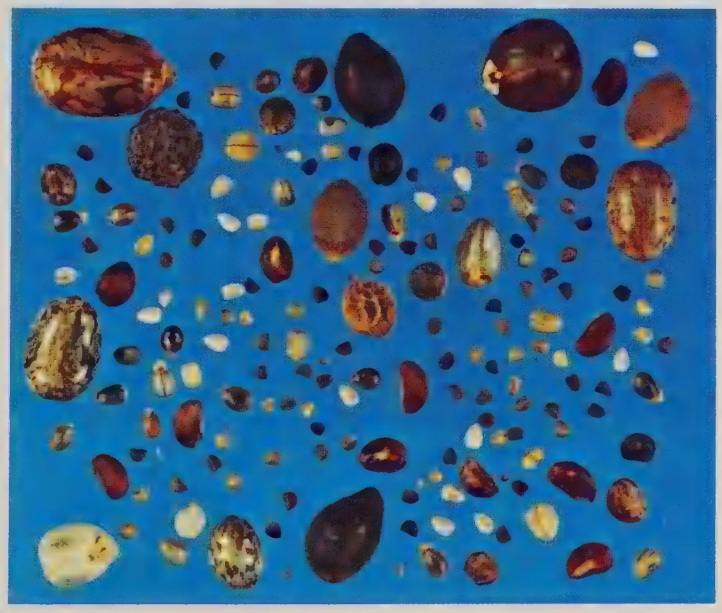
Euphorbia pulcherrima. Poinsettia. An ornamental with red bracts.

Hevea brasiliensis. Para rubber tree. Source of most natural rubber.

Manihot esculenta. Cassava. Source of tapioca and arrowroot starch.

Ricinus communis. Castor bean. Source of castor oil.

EUPHORBIACEAE



FABACEAE (LEGUMINOSAE), legume family

The legume family is a huge cosmopolitan group with herbs, shrubs, and trees in diverse habitats and with diverse specializations. The family is divided into three subfamilies, sometimes considered as independent families. Each subfamily will be treated separately.

FABACEAE subfamily CAESALPINIOIDEAE, senna subfamily

PROPAGULE

Seed symmetrical or nearly so; usually rounded at one end, tapering to the other end, sometimes circular; usually flattened, sometimes rounded. **Seedcoat** smooth, rarely rough or pitted; usually shiny; sometimes cracked in complete circles around the seed; frequently dark brown to black; occasionally with a horseshoe-shaped or elliptic line (pleurogram) on each face. **Hilum** at tapered end, small.

SUBFAMILY IMPORTANCE AND DISTRIBUTION

Mostly tropical and subtropical trees and shrubs. The subfamily contains some medicinal plants, dyes, ornamentals, fruit trees, and timber plants.

IMPORTANT MEMBERS

Bauhinia. Orchid trees. Ornamentals.

Caesalpinia. Caesalpinia. Ornamentals, dye and timber plants.

FABACEAE subfamily CAESALPINIOIDEAE

Cassia. Cassia and senna. Common tropical plants, source of the purgative senna.
Ceratonia siliqua. Carob. Pods used as a substitute for chocolate.
Cercis. Redbud. Ornamental.
Copaifera. Copaifera. Tree source of copal, cough medicine, and natural liquid fuel.
Gleditsia. Locust. Ornamental trees.
Gymnocladus dioica. Kentucky coffee tree. Common tree of Eastern woodland.
Haematoxylon. Brazilwood and logwood. Source of timber and dye.
Poinciana regia (Delonix regia). Royal poinciana. Spectacular flowering tree of southeastern United States.
Tamarindus indica. Tamarind. Pods used as fruit.

FABACEAE subfamily FABOIDEAE (PAPILIONOIDEAE), pea subfamily

PROPAGULE

Seed usually bent, curved or spherical; frequently notched. **Seedcoat** smooth, rarely rough, sculptured, or fuzzy, usually shiny; color variable. **Hilum** usually lateral, if at end, then at broad end of seed; usually conspicuous, with a split down the middle; sometimes with outgrowths down the hilum.

The split down the hilum is signal character for the subfamily. However, it is obscured by a white spongy cushion (the epihilum) in garden beans *(Phaseolus)* and some allies. Some seeds of Malvaceae also have a split hilum; however, the Malvaceae seeds usually have regular sculpturing or ornament on the seedcoat. *Arachis* (peanuts) have a papery seedcoat and obscure hilum.

Fruit or fruit portions are the propagules in some members. The myriad forms are too diverse to describe.

SUBFAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan herbs, shrubs, and trees which are important as food and fodder plants, timbers, weeds, medicinal plants, and spices.

IMPORTANT MEMBERS

Arachis hypogaea. Peanut. A nut.

Canavalia. Jack beans. A vegetable.

Cajanus cajan. Pigeon pea. Common vegetable in tropics.

Cicer arietinum. Garbanzo or chick pea. A vegetable.

Dalbergia and related genera. Rosewoods. Colorful, hard, allergy-causing timbers.

Galega officinalis. Goatsrue. Poisonous, herbaceous, deep-rooted perennial. Leaves and seeds contain toxic alkaloid. Introduced into Utah as potential forage crop, goatsrue has spread and

invaded irrigation ditches, waterways, and irrigated or normally moist pastures.

Glycyrrhia glabra. Liquorice. A flavor plant.

Glycine max. Soybean. An important crop.

Indigofera. Indigo. Source of the dye.

Lathyrus. Sweet peas. Ornamental plants.

Lens culinaris. Lentil. A vegetable.

Lupinus. Lupine. Ornamental.

Medicago sativa. Alfalfa. A hay plant.

Phaseolus coccineus. Runner bean. An ornamental and vegetable.

Phaseolus lunatus. Lima bean. A vegetable.

Phaseolus vulgaris. Garden bean. A vegetable.

Pisum sativum. Pea. A vegetable.

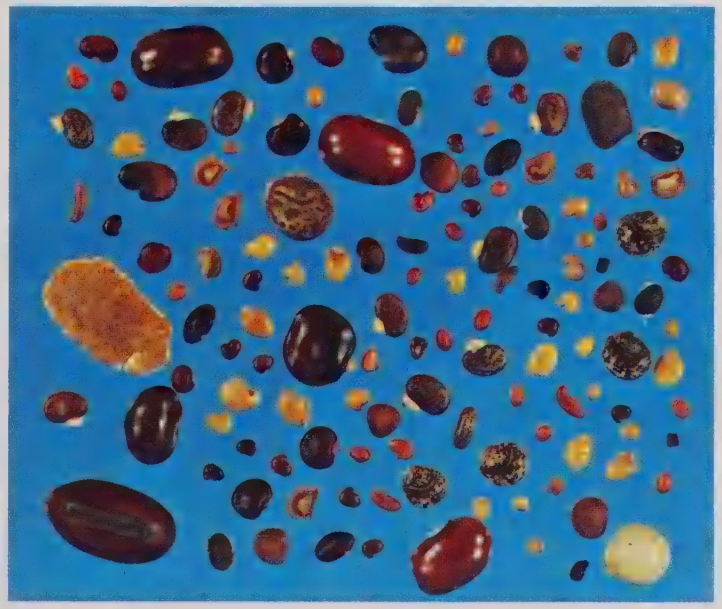
Pterocarpus santalinus. Sandalwood. A specialty timber.

Trifolium. Clover. Pasture and lawn plants.

Vigna radiata. Mung bean. Source of bean sprouts.

Vicia faba. Broad bean. A vegetable.

Wisteria. Wisteria. A beautiful flowering climbing plant.



Glycine max

FABACEAE subfamily MIMOSOIDEAE, mimosa subfamily

PROPAGULE

Seed symmetrical or nearly so; usually rounded at one end, tapering to the other, sometimes circular or heart-shaped; usually flattened. **Seedcoat** smooth, rarely rough; usually shiny; frequently dark brown to black; usually bearing a horseshoe-shaped line (pleurogram) on each face. **Hilum** at tapering end, usually small; occasionally funiculus remains attached and may be coiled or folded around seed.

SUBFAMILY IMPORTANCE AND DISTRIBUTION

Mostly tropical and subtropical shrubs and trees. Important as ornamentals, some vegetable gums, timbers, and weeds.

IMPORTANT MEMBERS

Acacia. Acacias. Ornamental plants.
Acacia senegal. Gum arabic. Source of the gum.
Acacia melanoxylon. Blackwood tree. Source of the hardwood.
Albizia. Albizias. Ornamental and timber plants.
Albizia julibrissin. Mimosa tree. Horticultural plant.
Mimosa. Mimosa. A large genus of mostly tropical trees.
Mimosa pudica. Sensitive plant. A horticultural novelty.
Mimosa invisa. Giant sensitive plant. Robust spreading biennial or perennial shrub with seeds borne in spiny pods adapted for external transport. Invades cultivated areas, pastures and moist

waste areas, choking out other vegetation with masses of spiny stems. It is extremely detrimental in fields maintained by manual labor because of injuries inflicted by spines. Forms impenetrable thickets that have neither animal predators nor plant competitors. Present in Argentina, S.E. Asia and Pacific Islands. Not reported in the United States.

Prosopis. Mesquites or screwbeans. Weeds and animal feed of southwest United States.

Prosopis ruscifolia. Mesquite. Aggressive weedy tree with spines to 35 cm long. Thickets are impenetrable to man or cattle. Rapid increase of populations in pasture and rangeland is favored by severe soil disturbance, grazing pressure, drought conditions, and reduced predator populations. Foliage unpalatable, but fruits readily eaten by livestock and wildlife and seeds dispersed through intestinal transport. Found in Argentina and Paraguay. Not reported in the United States.

JUNCACEAE, rush family

PROPAGULE

Seed minute, ca. 0.2-1.2 mm; ovoid, nearly globose or three-dimensionally egg-shaped. **Seedcoat** minutely roughened; outer coat loose and colorless and drawn out into long or short tails at opposite ends of the seed *(Juncus);* or outer coat may form a rounded white appendage over one end *(Luzula).*

The foregoing description is based on two widespread genera, *Juncus* (cosmopolitan) and *Luzula* (primarily Northern Hemisphere). Seeds of six other genera from Antarctica, South America, and South Africa seldom have been described.

FAMILY IMPORTANCE AND DISTRIBUTION

Worldwide herbs, mostly in cold temperate wet or damp areas. The plants have limited use as coarse fibers.

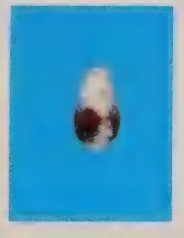
IMPORTANT MEMBERS

Juncus. Rush. Common plants in marshy areas.
Luzula. Wood rush. Common plants in marshy areas.

JUNCACEAE

Juncus torreyi

Luzula bulbosa



LAMIACEAE (LABIATAE), mint family

PROPAGULE

Nutlet elongate and sectoroid or elongate and rounded; one side usually with well-developed longitudinal angle. Nutlet **coat** smooth, with raised net-like areas, or rough; dull or shiny; hairs occasionally present on one end. Nutlet **scar** at end or slightly on side, often conspicuous and white and in the form of a V or two eye-like slits.

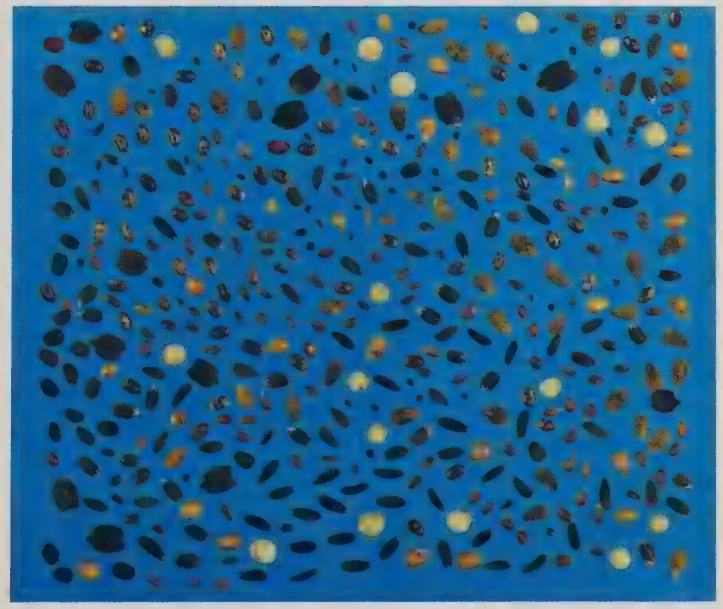
FAMILY IMPORTANCE AND DISTRIBUTION

Mostly aromatic herbs. They are important spice plants and ornamentals.

IMPORTANT MEMBERS

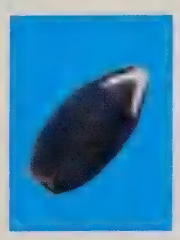
Coleus blumei. Coleus. Ornamental plants with brightly colored leaves.
Lavandula spica. Lavender. A common perfume.
Mentha piperita. Peppermint. A flavoring plant.
Mentha spicata. Spearmint. A flavoring plant.
Nepeta cataria. Catnip. A feline amusement.
Ocimum basilicum. Basil. A spice.
Origanum. Oregano and marjoram. Spice plants.
Salvia officinalis. Sage. A spice.
Thymus vulgaris. Thyme. A spice.

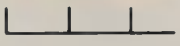
LAMIACEAE

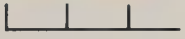


Nepeta cataria

Dracocephalum moldavica







LILIACEAE, lily family

PROPAGULE

Seed globose, elongate, sectoroid, or very flat, sometimes shriveled and berry-like. **Seedcoat** rough or smooth; sometimes winged; dull or shiny; usually brown or black. **Hilum** inconspicuous.

Seeds of Liliaceae are very diverse; it is difficult to identify many members by general family characteristics. Some members are propagated by bulblets.

The treatment of Liliaceae followed here includes the Amaryllidaceae of some authors.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly perennial herbs with bulbs or other enlarged underground parts. The family includes some ornamentals, poisonous plants, and a few food plants.

IMPORTANT MEMBERS

Allium cepa. Onion and shallot. Food plants.

Allium porrum. Leek. Vegetable.

Allium sativum. Garlic. Strong flavoring plant.

Allium schoenoprasum. Chives. A spice.

Asparagus officinalis. Asparagus. A spring vegetable.

Colchicum. Colchicum. Source of colchicine for medicine and plant breeding.

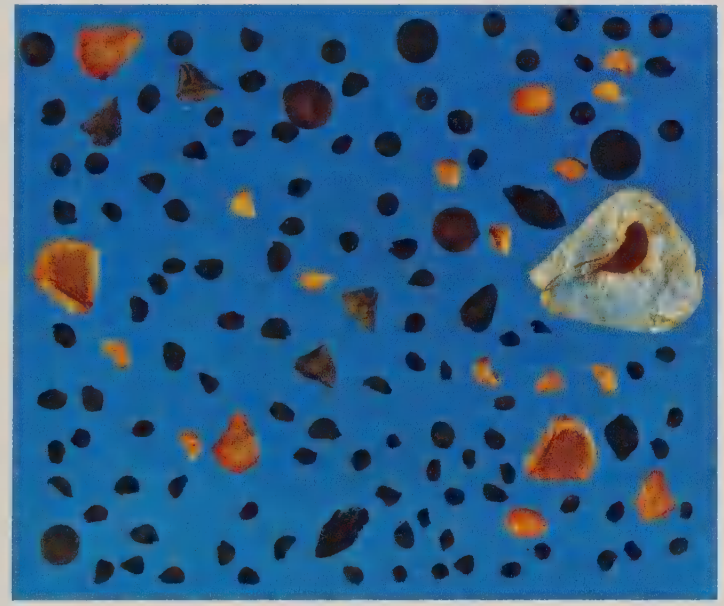
Dracaena. Dragon tree. An ornamental.

Lilium. Lily. Ornamentals.

Tulipa. Tulip. Ornamentals.

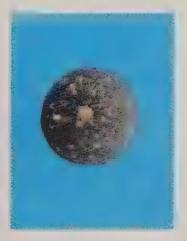
Zygadenus. Death camas. A poisonous plant.

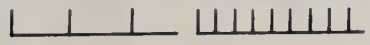
LILIACEAE



Allium cepa

Asparagus falcatus





LYTHRACEAE, loosestrife family

PROPAGULE

Seed of three types: (1) very small, less than 1.5 mm, and hemispherical, pyramidal, or spindle-shaped; (2) elliptic to heart-shaped and flattened, with a small rim of lighter color; (3) irregular shapes with a large single wing extending to one side, or completely around the main part of the seed. **Seedcoat** dull, not sculptured, often with cellular roughness. Colors usually tan to dark brown.

FAMILY IMPORTANCE AND DISTRIBUTION

A small family of herbs, shrubs, and trees from mostly tropical regions. The family includes ornamentals, and dye and timber plants.

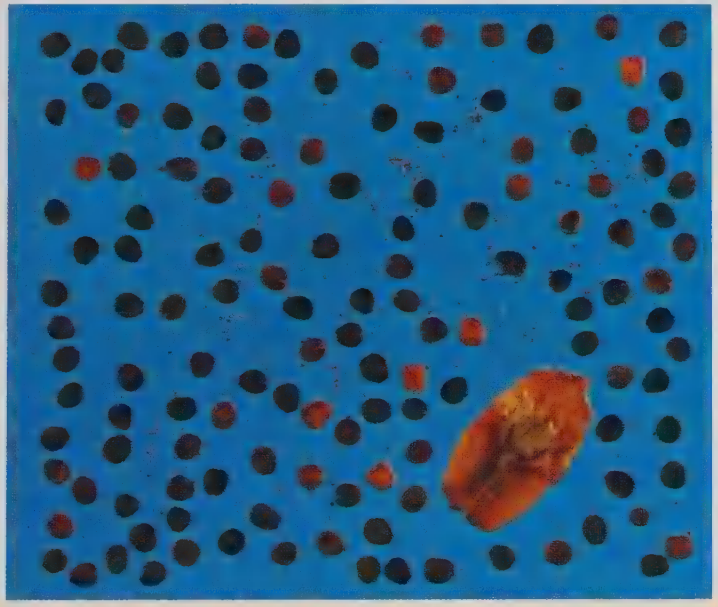
IMPORTANT MEMBERS

Lagerstroemia indica. Crape myrtle. Ornamental woody plant.

Lawsonia inermis. Henna. Source of the dye.

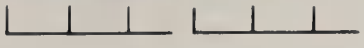
Lythrum. Loosestrifes. Ornamental plants.

LYTHRACEAE



Ammania coccinea

Cuphea lanceolata



MALVACEAE, mallow family

PROPAGULE

Seed of two types: (1) nearly globose to plump-ellipsoidal, with hilum at or near end; (2) strongly kidney-shaped and sectoroid. **Seedcoat** smooth to rough or warty, frequently with parallel sweeping pattern of small scales, protuberences, or straight or star-like hairs (very long hairs in *Gossypium).* **Hilum** terminal or within notch of kidney-shaped seeds, frequently covered with a patch of rough or grill-like material which easily cracks off as a unit; sometimes partially or completely split down the middle.

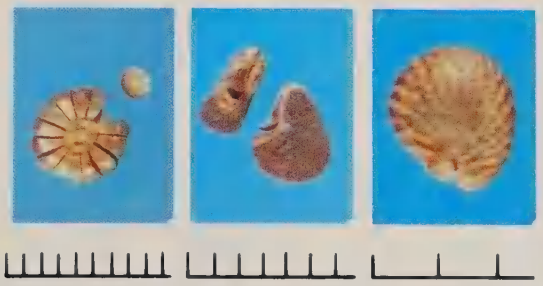
Fruit segment is propagule in some members. Fruit segments are sectoroid, with hairs, wings or other ornamentation and sculpturing.

Seeds of Malvaceae are quite similar to those of Caryophyllaceae, but generally can be distinguished by flat sides formed from packing in fruit. The hilum of Malvaceae seeds sometimes is split like those in Fabaceae subfamily Faboideae, but the split in Malvaceae often is incomplete, and seedcoat patterns of Malvaceae usually distinguish them.

Fruits of Malvaceae resemble small rounds of cheese; hence, the common name is cheese for many members. Segments of the fruit are disseminated like cut sections of a cheese round, and have the corresponding flat faces and rounded back. The seeds frequently reflect this condition. See the terminology section for more information.

MALVACEAE

Malva neglecta | *Abutilon theophrasti* | *Malope trifida*



FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan herbs, rarely shrubs or trees. Some fiber plants, ornamentals and weeds.

IMPORTANT MEMBERS

Althaea officinalis. Marshmallow. Source of natural sweetened paste.

Althaea rosea. Hollyhock. An ornamental.

Gossypium. Cotton. The most important natural fiber.

Hibiscus. Hibiscus. Ornamentals.

Hibiscus esculentus. Okra. A vegetable.

Malva. Mallow or cheese. Common weeds and ornamentals.

ONAGRACEAE, evening primrose family

PROPAGULE

Nutlet egg-shaped or compressed and bearing hooked bristles; containing one or two seeds. Fruit **scar** small.

Seed angular, or round-elongate. **Seedcoat** smooth to slightly rough, with long tuft of hairs at seed apex in *Epilobium;* brown to yellowish-brown. **Hilum** small.

Fruit may be a dried berry in some members.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan, but primarily southwestern United States and Mexico. Herbs and shrubs, including a few aquatics and ornamentals.

IMPORTANT MEMBERS

Clarkia. Clarkia. Ornamentals.
Epilobium. Fireweed. Common showy wild plants in western United States.
Fuchsia. Fuchsia. Ornamental shrubs.
Oenothera. Evening primrose. Ornamental plants.

ONAGRACEAE

Circaea quadrisulcata

Boisduvalia densiflora

Oenothera caespitosa

Oenothera jamesii

OROBANCHACEAE, broomrape family

PROPAGULE

Seed very small, less than 0.4 mm; globose to slightly elongate. **Seedcoat** tan to honey color; cellular patterned. **Hilum** inconspicuous. Seeds much like smaller ones in Scrophulariaceae.

FAMILY IMPORTANCE AND DISTRIBUTION

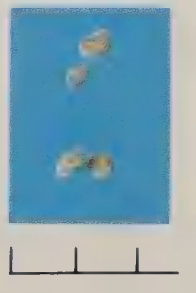
Mostly north temperate herbs. All members are parasites. They seem to be little more than Scrophulariaceae modified as parasites.

IMPORTANT MEMBERS

Orobanche. Broomrape. All species act as root parasites on flowering plants, including major crops.

OROBANCHACEAE

Orobanche ludoviciana



OXALIDACEAE, wood sorrel family

PROPAGULE

Seed of two types: (1) lens-shaped to egg-shaped and flattened, and seedcoat with coarse furrows and ridges across the seed; (2) globose or nearly so, and seedcoat with coarse furrows and ridges or rarely smooth and dull. Seedcoat tan to brown or black.

Propagules sometimes are bulblets.

FAMILY IMPORTANCE AND DISTRIBUTION

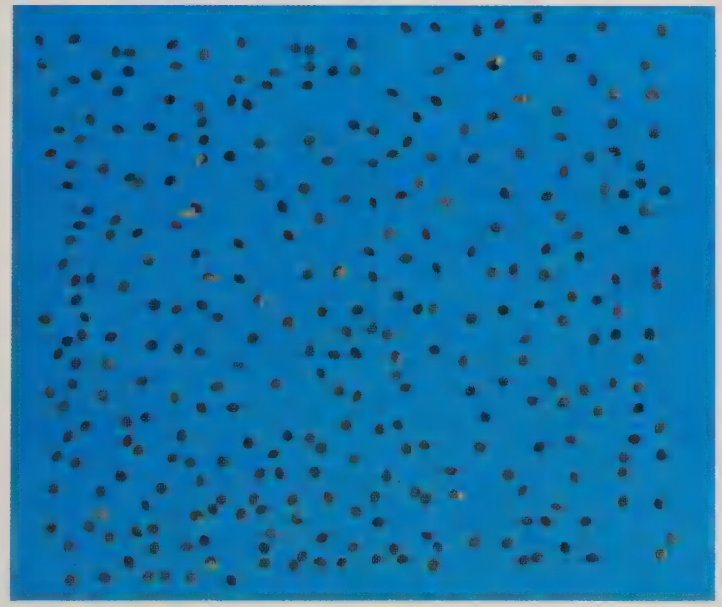
Mostly tropical and subtropical herbs. The family includes a few ornamentals and weeds.

IMPORTANT MEMBERS

Oxalis. Wood sorrels and Bermuda buttercup.

Ornamentals and some weeds.

OXALIDACEAE



Oxalis valdiviensis

Oxalis europaea

PAPAVERACEAE, poppy family

PROPAGULE

Seed globose to slightly elongate or almost kidney-shaped, slightly larger at one end. **Seedcoat** smooth to regularly net-sculptured, usually with a keel along one side, sometimes with an enlarged strikingly colored funiculus enlargement; dull or shiny and dark colored. **Hilum** inconspicuous.

Papaveraceae seeds that are not curved can be distinguished from Scrophulariaceae seeds by the presence of funicular remnants and lack of prominent net-sculpturing. Also, Papaveraceae seeds tend to be larger than 2 mm; Scrophulariaceae seeds tend to be smaller than 2 mm.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly north temperate herbs with milky or colored juice. The family includes a few drug plants, ornamentals and weeds.

IMPORTANT MEMBERS

Argemone. Prickly poppy. Ornamentals and soap oil plants.

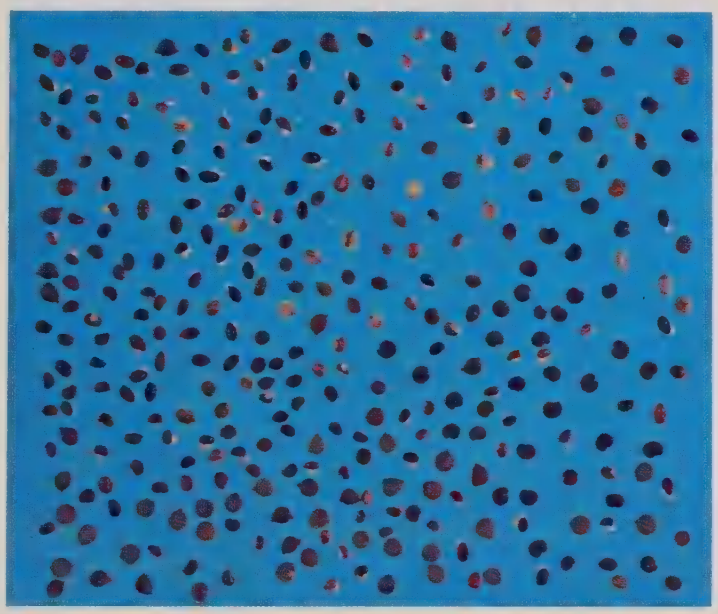
Eschscholzia californica. California poppy. An ornamental.

Papaver orientale. Oriental poppy. A garden ornamental.

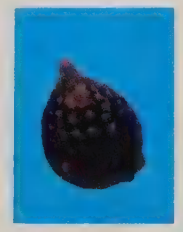
Papaver somniferum. Opium poppy. Opium comes from the latex of fruits.

Sanguinaria canadensis. Bloodroot. Common spring flowering plant of Eastern woodlands.

PAPAVERACEAE

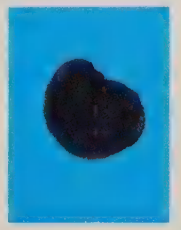


Argemone pleiacantha

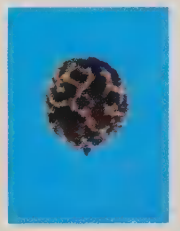


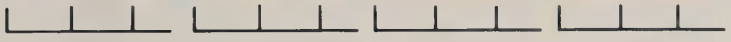
Macleaya cordata

Dicentra chrysantha



Eschscholzia californica





PLANTAGINACEAE, plantain family

PROPAGULE

Seed boat-shaped to elliptic. **Seedcoat** smooth; minutely sculptured; dull or shiny; black, brown, or reddish. **Hilum** on the side, usually very large, covering almost the entire side, and with obvious markings.

Some other families (Rubiaceae, Scrophulariaceae) have large lateral hila, but they are never as large as in most Plantaginaceae. The family is dominated by the genus *Plantago,* on which the above description is drawn.

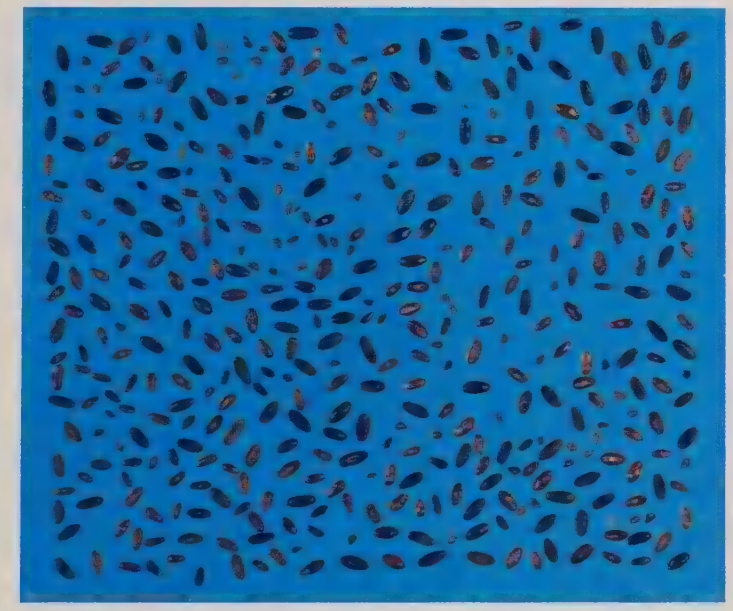
FAMILY IMPORTANCE AND DISTRIBUTION

Mostly temperate annual to perennial herbs. The only important genus, *Plantago,* has several important weeds.

IMPORTANT MEMBERS

Plantago. Plantain. Field and lawn weeds.

PLANTAGINACEAE



Plantago psyllium

POACEAE (GRAMINEAE), grass family

PROPAGULE

Grain within a lemma and palea, and perhaps other bracts and flower cluster parts; sometimes a naked grain. Grain elongated; round or compressed. Basal embryo easily seen through the fruit coat. Fruit **scar** basal and on side opposite embryo; usually conspicuous, a red or black dot.

Most fruits of Poaceae are readily identified to family. Only a few members have puzzling peculiar fruits: e.g. bur-like fruits or some white bony fruits.

The family is traditionally divided into two artificial subfamilies based on study of flower cluster structure. This guide recognizes these two subfamilies.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan herbs. Although not the largest, the family is ecologically the most dominant and economically by far the most important. It provides all the cereal crops, most of the sugar and grazing for domestic and wild animals, as well as bamboos, canes and reeds. It is the most important weed family.

POACEAE subfamily FESTUCOIDEAE

PROPAGULE

Grain characters as in family description; often with a small rachilla and other parts of other florets and glumes.

IMPORTANT MEMBERS

Agropyron. Wheatgrass. Some forage plants and a bad weed, *A. repens,* quackgrass.

Avena. Oats. Crop plants and common weeds.

Avena ludoviciana. Wild oat. A weed related to *A. fatua,* the common wild oat of waste places.

Bromus. Bromegrass. Important forage grasses and weeds.

Cynodon dactylon. Bermuda grass. Lawn grass and awful weed in several crops.

Eleusine indica. Goosegrass. A common weed.
Elymus. Wild rye. Good forage grasses.
Festuca. Fescuegrass. Forage grasses.
Hordeum vulgare. Barley. A food grain.
Leptochloa chinensis. Asian sprangletop. Annual or perennial weed which thrives in wet or flooded fields in Asia and Africa. Reported in eastern United States.
Oryza sativa. Rice. The most important food crop.
Oryza rufipogon, O. longistaminata, and *O. punctata.* Red rice. They grow with commercial rice and interbreed with it. Red rice plants yield commercially inferior red grains, have more seed shattering, outcompete white rice, and lodge more readily, all of which significantly reduce quality rice yields.
Phalaris canariensis. Canary grass. An ornamental grass.
Phleum. Timothy. Forage and hay grasses.
Poa. Bluegrass. Forage and lawn grasses.
Secale cereale. Rye. A crop plant.
Triticum. Wheat. A crop plant.
Stipa. Needlegrass. Important forage grasses. Some species have sharp fruits which injure livestock.
Zizania aquatica. Wild rice. Food for aboriginal Americans.

Agropyron violaceum

POACEAE subfamily PANICOIDEAE

PROPAGULE

Grain characters as in family description; often with a sterile lemma and usually a sterile palea below grain; two rachillas, if present.

IMPORTANT MEMBERS

Andropogon. Bluestem. Forage grasses, and the principal grass of the tall grass prairie.

Cenchrus. Sandbur. Forms horribly spiny burs made of sterile branches around the grains.

Digitaria. Crabgrass. Bad weeds.

Digitaria scalarum. Fingergrass or African couchgrass. Creeping rhizomatous perennial grass. One of the worst weeds in major crops of East Africa. Not in the United States.

Echinochloa crus-galli. Barnyard grass. An awful worldwide weed.

Echinochloa colonum. Jungle rice. A bad rice weed.

Imperata brasiliensis. Brazilian satintail. Aggressive, coarse rhizomatous, perennial grass which infests perennial crops. Found in Florida and Alabama.

Imperata cylindrica. Cogon grass. Aggressive, coarse, perennial grass which forms tall, dense stems and produces abundant wind-dispersed seed. Unable to survive in deeply plowed soils, it invades tree crops, nurseries and pastures. Alternate host for rust. In Alabama, Mississippi, and Florida.

Ischaemum rugosum. Murainograss. Aggressive, annual grass in warm climates. Recently reported in Maryland.

Panicum. Panicum. Large genus of range grasses and minor human food plants.

Pennisetum clandestinum. Kikuyugrass. Aggressive, rhizomatous perennial grass, which forms tough dense sod. Forms high quality forage, but is a pest in perennial crops. Present in California and Hawaii.

Pennisetum pedicellatum. Kyasumagrass. Erect, tufted perennial grass which spreads by rhizomes and abundant seeds. Tends to dominate cropland and pastures. Found in tropics and subtropics of Africa, Asia, and Australia. Possibly in Florida.

Pennisetum polystachion. Missiongrass. Aggressive tufted annual or perennial grass. Invades upland areas cleared for cultivation. Found in tropics and subtropics of Africa, Asia, and Australia. Not reported in the United States.

Rottboellia exaltata. Itchgrass. Aggressive tall annual grass with needle-like hairs; spreads rapidly dominating other vegetation. In Florida and Louisiana.

Saccharum officinarum. Sugarcane. The source of cane sugar.

Saccharum spontaneum. Wild sugarcane. Tall dense tufted rhizomatous perennial grass with deep, spreading roots. Inhabits warm regions of India, Malaya, and Africa. Not in the United States.

Setaria. Setaria or bristlegrass. Common weeds.

Sorghum halepense. Johnson grass. A common weed.

Sorghum bicolor. Sorghum. Cultivated for grain, silage and syrup.

Zea mays. Maize or corn. Food for livestock and man.

Digitaria setivalva

POLYGONACEAE, smartweed family

PROPAGULE

Achene triangular to flattened in cross section; circular to teardrop-shaped or almond-shaped in side view; sometimes winged. Achene **coat** smooth to rough; frequently shiny; brown to red or black. Achene **scar** basal, sometimes surrounded by persistent sepals.

Most achenes in the family conform to the above description. A few have bizarre modifications of the achene coat. These can only be identified to family with the aid of technical treatments or extensive reference collections.

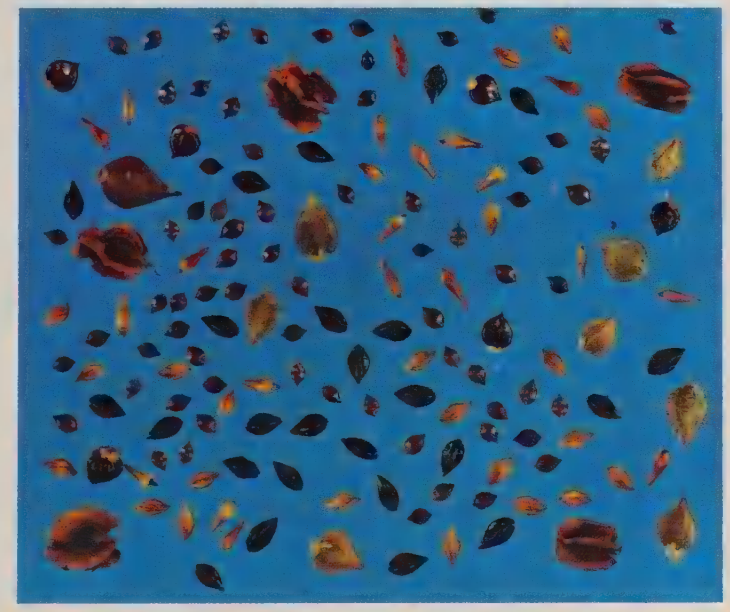
FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan herbs, some shrubs, and a few trees. The group includes a few ornamentals and some food plants.

IMPORTANT MEMBERS

Antigonon leptopus. Coral vine. An ornamental.
Fagopyrum sagittatum. Buckwheat. A food plant.
Polygonum. Smartweed. Weeds.
Rheum rhaponticum. Rhubarb. Garden plant with edible leafstalks.
Rumex. Docks. Weeds.

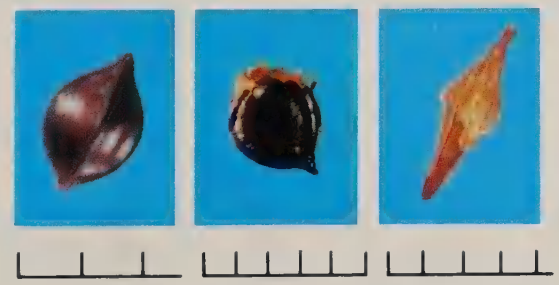
POLYGONACEAE



Rumex crispus

Polygonum campanulatum

Eriogonum umbellatum



PORTULACACEAE, purslane family

PROPAGULE

Seed kidney-shaped to horseshoe-shaped, or almost circular with a notched marginal rim; partially flattened. **Seedcoat** smooth or rough, often with parallel sweeping patterns of warts or other protrusions; shiny or dull; black, grey, or brown, rarely metallic. **Hilum** at hollow of kidney-shaped seeds or at marginal notch of circular seeds; often conspicuous and light colored or covered with a light colored funiculus remnant.

Seeds of Portulacaceae resemble those of the related Caryophyllaceae, Amaranthaceae, and to a lesser degree Chenopodiaceae. Seeds of Portulacaceae can be distinguished by the prominent hilum and persistent light colored funiculus.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan annual to perennial herbs or rarely subshrubs. A few members are ornamentals and weeds.

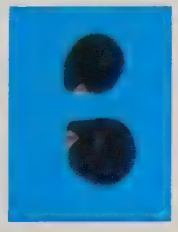
IMPORTANT MEMBERS

Claytonia. Spring beauty. An attractive plant of eastern woodlands.
Portulaca grandiflora. Portulaca. Bedding annual.
Portulaca oleracea. Purslane. Succulent weed.

PORTULACACEAE

Calandrina menziesii

Portulacea oleracea



PRIMULACEAE, primrose family

PROPAGULE

Seeds often irregularly pyramidal with rounded back, sometimes approximately globose to globose-slightly-flattened, or elongate and round in cross section. **Seedcoat** rough or covered with bubble-like scales, papery remnants, or small sculpturing, rarely smooth; brown or black. **Hilum** inconspicuous, elongated, about the same color as the seed, located along the intersection of two flat sides, or on the side of somewhat flattened seeds.

Seeds of this family have little to distinguish them. The seedcoat is sometimes peculiar. It looks like dried seaweed or bubbles of boiling brown sugar.

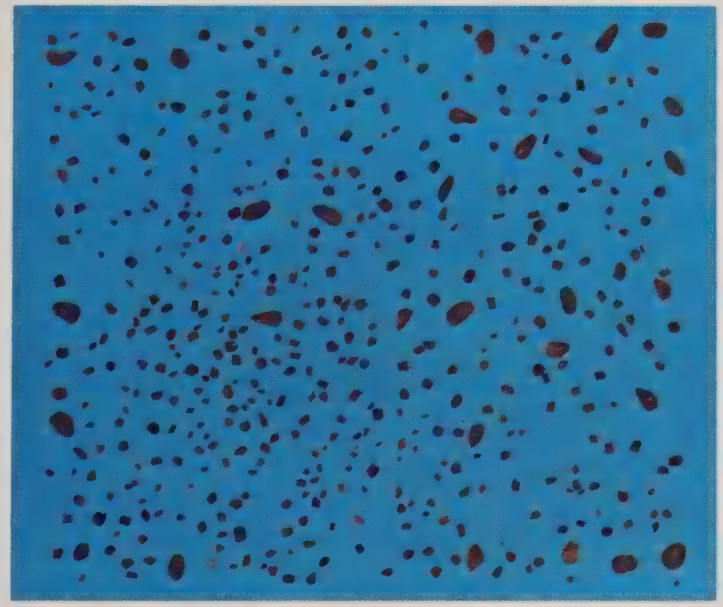
FAMILY IMPORTANCE AND DISTRIBUTION

North temperate perennial or annual herbs. The family includes some ornamentals and weeds.

IMPORTANT MEMBERS

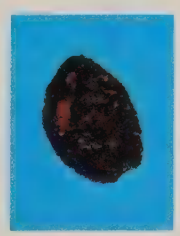
Anagallis arvensis. Pimpernel. Poisonous weed.
Cyclamen hederifolium. Cyclamen. Ornamentals.
Primula. Primrose. Ornamental plants.

PRIMULACEAE

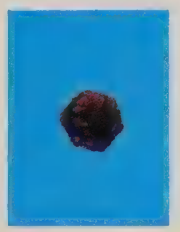


Primula agleniana

Androsace spinulifera



Primula bulleyana



RANUNCULACEAE, buttercup family

PROPAGULE

Achene or similar fruit; egg-shaped to oblong, usually slightly asymmetrical, flattened or sometimes round in cross-section; often tipped with a short or long persistent style which may be irregularly broken off. Fruit **coat** smooth to rough, sometimes sculptured or rarely spiny, often covered with short hairs, the persistent styles sometimes covered with long plume-like hairs. Fruit **scar** at end opposite style.

Sometimes a **seed;** egg-shaped or oblong, flattened or round or triangular with ribbed edges in cross section, sometimes sectoroid. **Seedcoat** smooth or wrinkled or with small scales; often with a prominent longitudinal ridge which may be obscured by wrinkles or scales; tan to brown or black. **Hilum** inconspicuous, at the end of elongated seeds.

Ranunculaceae fruits with plumose hairs are often superficially similar to fruits of Asteraceae and seeds of Asclepiadaceae. Ranunculaceae fruits differ because they are often asymmetrical, have persistent styles, have small hairs on the fruit walls, and have plumose hairs arising all along the persistent style. Some seeds of Ranunculaceae are retained within fleshy fruits.

FAMILY IMPORTANCE AND DISTRIBUTION

Herbs and woody climbers mostly from temperate and cold regions. The family includes some well-known wildflowers and garden ornamentals.

IMPORTANT MEMBERS

Anemone. Windflowers or anemones. Garden plants.

Aquilegia. Columbine. Ornamental plants.

Clematis. Clematis. Ornamental climber.

Delphinium. Larkspur. Cultivated plants and some species poisonous to livestock.

Ranunculus. Buttercups. Common wildflowers.

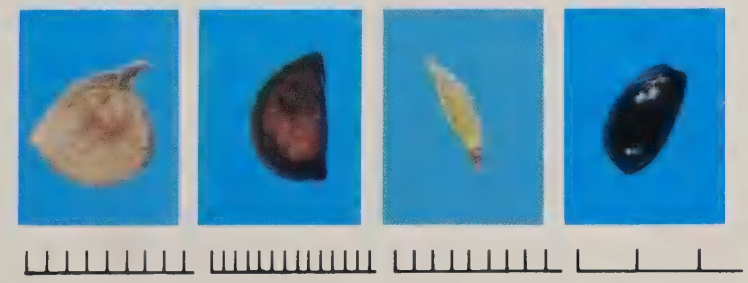
RANUNCULACEAE

Ranunculus eisenii

Actaea arguta

Hepatica triloba

Aquilegia canadensis



ROSACEAE, rose family

PROPAGULE

Propagule of at least six different forms: (1) small achenes, sometimes with persistent styles, sometimes with persistent hooked styles, sometimes hairy; free or clustered, sometimes attached to a fleshy central tissue (as in strawberry). (2) An aggregate of small berry-like single-seeded fruits (as in blackberries). (3) A cluster of small achenes surrounded by a cup of green tissue and sometimes other flower part remnants (as a rose hip). (4) A fleshy fruit with a stony inner fruit portion (stone) which surrounds the seed (as a peach). (5) A cluster of seeds surrounded by grainy fleshy pulp (as an apple). (6) Seeds of the above fruits.

Propagules of Rosaceae are very diverse. It is difficult to circumscribe propagule characters of the family except by tabulation of many forms.

FAMILY IMPORTANCE AND DISTRIBUTION

A large family of herbaceous and woody plants, primarily in the north temperate regions.

The family includes many agriculturally important fruits and ornamental plants.

IMPORTANT MEMBERS

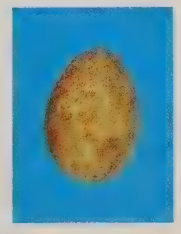
Crataegus. Hawthorn. An ornamental tree.
Fragaria. Strawberries. Garden food plants.
Malus. Apple. A tree fruit.
Prunus. Cherry, peach, apricot, plum, almond. Food plants.
Pyrus. Pear. Fruit tree.
Rosa. Roses. Ornamental garden plants.
Rubus. Raspberries and blackberries. Fruiting shrubs.
Spiraea. Spiraea or virgin's bower. Ornamental plants.

ROSACEAE

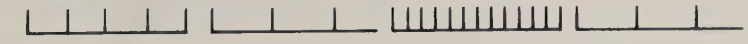
Pyrus calleryana

Physocarpus opulifolius

Prunus avium



Rubus idaeus



RUBIACEAE, madder family

PROPAGULE

Nutlet or dry fleshy fruit; smooth, warty, hairy or spiny; fruit usually splitting longitudinally at maturity into two segments, thus fruit halves have a flattened or concave face and are asymmetrical in cross section. Fruit **coat** and fruit **scar** variable.

Seeds vary greatly in size and outline from oval, oblong, to orbicular; compressed, deeply concave, or with funiculus on one side, or hemispherical with slit on flat side. **Seedcoat** smooth to netted; rarely winged or appendaged; brown or yellow-brown. **Hilum** on side or end; conspicuous or inconspicuous.

The diverse propagules of this family are very difficult to describe.

FAMILY IMPORTANCE AND DISTRIBUTION

Large family of tropical trees or shrubs and a few herbaceous temperate members. The family includes a few drug plants, some weeds, and ornamentals.

IMPORTANT MEMBERS

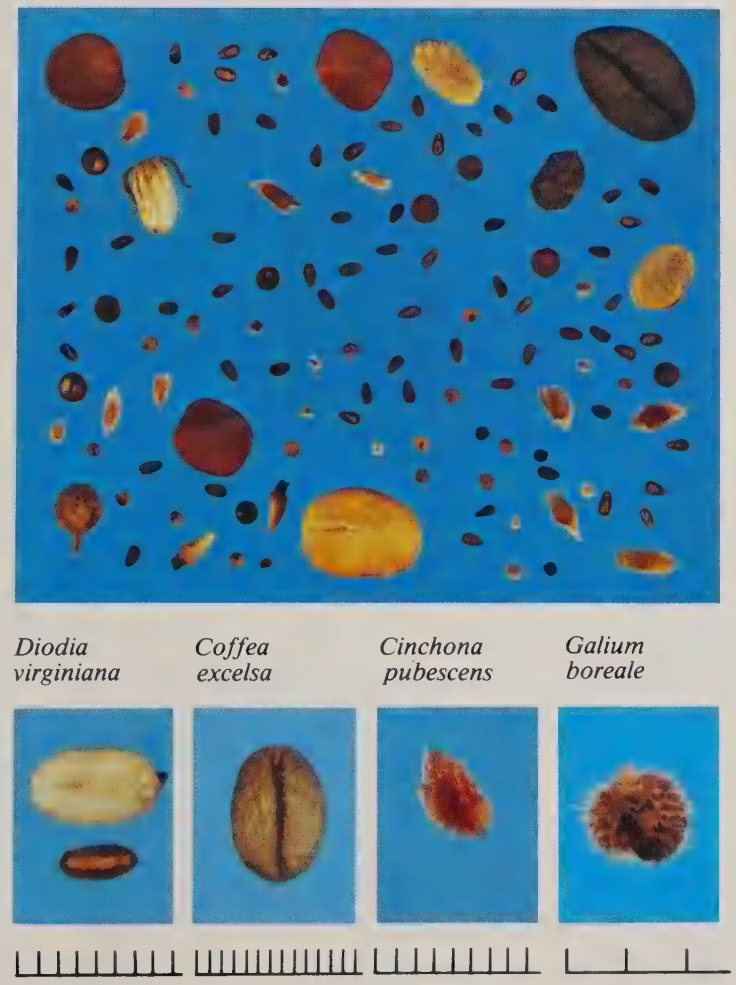
Cinchona. Quinine plant. Source of the bark for medicine.

Coffea arabica. Coffee. Source of beans for the beverage.

Galium. Bedstraw. Common North American plants.

Gardenia florida. Gardenia. An ornamental plant.

RUBIACEAE


Diodia virginiana
Coffea excelsa
Cinchona pubescens
Galium boreale

SCROPHULARIACEAE, snapdragon family

PROPAGULE

Seed generally small; usually angled, elongated-pyramidal or oblong, egg-shaped, globose, hemispherical, or flattened and more or less circular. **Seed-coat** generally honeycomb-sculptured, pitted, ridged or furrowed, seldom smooth; occasionally winged; dull; pale yellow to brown or black. **Hilum** at end or on side; hila on side often very large and ornamented inside.

Seeds are sometimes covered with transparent, sometimes net-veined, envelopes.

Seeds of the related family Plantaginaceae also have large hila on the side. However, seeds of those Scrophulariaceae which have large lateral hila are oblong, not boat shaped, and they usually have prominent sculpturing.

The seeds are superficially similar to some Papaveraceae because of the net-sculpturing. See the distinguishing characters listed under Papaveraceae.

FAMILY IMPORTANCE AND DISTRIBUTION

Mostly north temperate herbs. The family includes some ornamental plants and weeds.

IMPORTANT MEMBERS

Antirrhinum majus. Snapdragon. A garden ornamental.

Digitalis. Foxglove. An ornamental and drug plant.

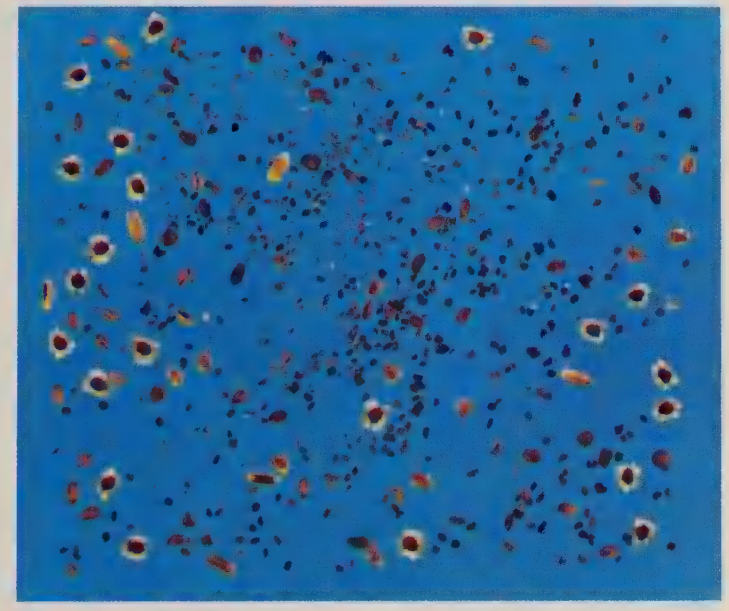
Mimulus. Monkey flowers. Ornamental plants.

Striga. Witchweeds. Herbaceous annuals which parasitize roots of many crop plants and cause great economic loss.

Verbascum. Mullein. A common weed.

Veronica. Speedwell. Bedding plants.

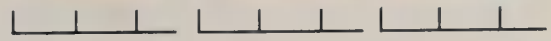
SCROPHULARIACEAE



Aureolaria villosa

Collinsia grandiflora

Agalinus tenuifolia



SOLANACEAE, tomato family

PROPAGULE

Seed of two types: (1) Moderate size, flattened thin to thick, circular to teardrop-shaped in outline. (2) Small cubical to slightly elongate. **Seedcoat** finely netted, pitted, or with other regular depressions, rarely with thick hairs (remnants of the fleshy fruit); pale yellow to brown. **Hilum** on compressed seeds marginal, occasionally in a slight notch; on cubical seeds at end.

Some of the small seeds are similar to those of Scrophulariaceae because of the net-sculpturing. One of these, *Nicotiana,* tends to have undulating sculpture, rather than closed net-sculpturing.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan herbs with uses as vegetables, ornamental, drug, and poison plants.

IMPORTANT MEMBERS

Atropa belladonna. Belladonna. Source of atropine.

Capsicum. Peppers. The fruits are a spice.

Datura stramonium. Jimson weed. A very poisonous and hallucinogenic plant.

Lycopersicon esculentum. Tomato. A garden vegetable.

Mandragora officinarum. Mandrake. Medicinal plant of folklore.

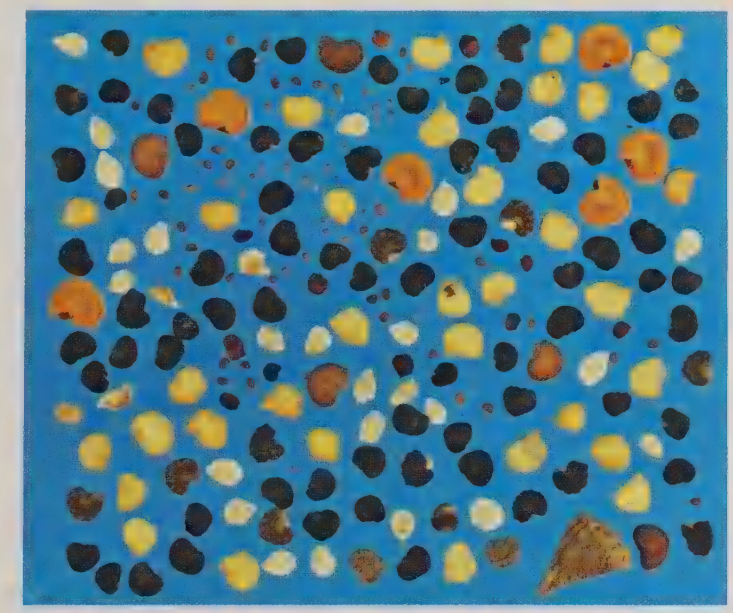
Nicotiana tabacum. Tobacco. Source of the smoked leaf.

Petunia. Petunia. Ornamental plants.

Solanum. Nightshades. Poisonous plants.

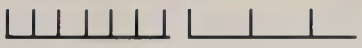
Solanum tuberosum. Potato. A plant with edible tubers.

SOLANACEAE



Capsicum frutescens

Nicotiana tabacum



SPARGANIACEAE, bur-reed family

PROPAGULE

Achenes conical, persistent style on broad end, and usually a few flattened scales attached on the pointed end. Fruit **coat** pale brown. Fruit **scar** at pointed end.

FAMILY IMPORTANCE AND DISTRIBUTION

The sole genus, *Sparganium,* the bur-reeds, consist of perennial amphibious herbs with a temperate or Arctic North Hemisphere distribution.

IMPORTANT MEMBERS

Sparganium. Bur-reeds. Plants of wet places.
Sparganium erectum. Exotic bur-reed. Large populations invade fresh water and hinder navigation.

SPARGANIACEAE

VERBENACEAE, vervain family

PROPAGULE

Berry-like fruit, or **nutlet** or nutlets; nutlets straight or slightly curved, spherical, elongate-sectoroid, boat-shaped, or compressed and curved. Nutlet **coat** smooth or sculptured. Nutlet **scar** basal to slightly lateral, fairly large.

The fruits of Verbenaceae are diverse. Nutlets are sometimes like those of Boraginaceae.

FAMILY IMPORTANCE AND DISTRIBUTION

Tropical to subtropical herbs or woody plants. The family includes a few ornamental and timber plants.

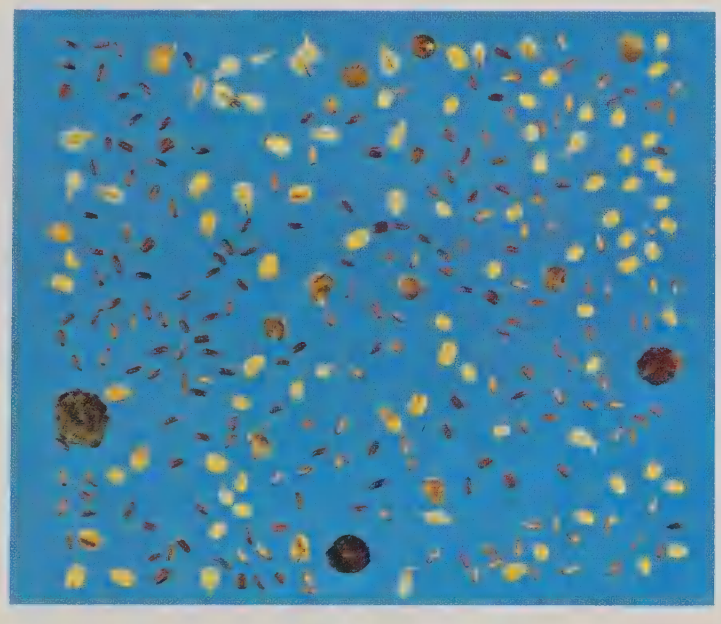
IMPORTANT MEMBERS

Lantana camara. Lantana. Ornamental shrub or climber.

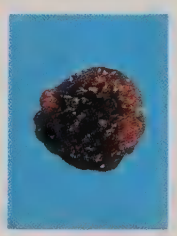
Tectona grandis. Teak. A timber tree.

Verbena officinalis. Vervain. Cultivated for herbal remedies.

VERBENACEAE



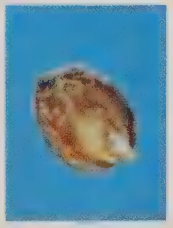
Lantana sellowiana



Callicarpa dichotoma

Verbena urticifolia

Priva mexicana



ZYGOPHYLLACEAE, caltrop family

PROPAGULE

Fruit enclosed by many sharp spines and some scattered hairs. Fruit **coat** smooth; cream-colored to pale yellow. Fruit **scar** obscure.

The above description is based on the caltrop, *Tribulus,* the only plant of weedy significance.

FAMILY IMPORTANCE AND DISTRIBUTION

Herbs to trees from tropics or subtropics. The family includes some weeds and timber trees.

IMPORTANT MEMBERS

Guaiacum. Lignum vitae. A timber tree.

Tribulus terrestris. Puncture vine. A weed in dry areas of the American Southwest.

ZYGOPHYLLACEAE

AQUATIC FAMILIES 5

This section contains both family identification and the family catalog for important aquatic weeds. You can determine the family of an unknown aquatic weed using three basic steps. First, you classify the unknown weed by growth habit — floating, emergent, or submergent. To do this, compare the unknown weed to the descriptions of the three growth habits that follow.

Second, a separate key to aquatic families is provided for each of the three growth habits. Once you have determined the growth habit of the unknown weed, you use the key for that particular growth habit to determine the family of the unknown weed.

Third, when the key directs you to a family, find that family in the Aquatic Family Catalog. Use the family description and photographs to verify that the weed belongs in the family identified in the key.

GROWTH HABITS

Floating aquatic plants float on or slightly below the water surface. They do not root to the bottom. They have **little or no stem**, the **leaves are inflated**, and they have **many fine roots.**

Submergent aquatic plants are completely contained in the water column, and may or may not be rooted to the bottom. They have **limp stems** that are unable to support the plant.

Emergent aquatic plants are rooted to the bottom and protrude above the water surface. They have **rigid stems** that will support the plant above the water, and strong **supportive roots.**

KEYS TO AQUATIC FAMILIES

Once you have classified the aquatic plant by growth habit — floating, submergent, or emergent — use the appropriate key to identify the family of the plant. The keys rely primarily on leaf arrangement and type to distinguish one family from another. Below is a brief description of the arrangements and types you will encounter.

Leaf Arrangements

There are three basic leaf arrangements: opposite, alternate, and whorled. **Opposite** leaves branch from the main stem directly across from each other on opposite sides of the stem. **Alternate** leaves branch from the stem at staggered intervals along opposite sides of the stem, rather than directly across from each other. **Whorled** leaves sprout from a common plane around the stem and contain at least three leaves in each plane.

Leaf Types

The two basic types of leaves are simple and compound. A **simple** leaf contains only one leaf blade on each leaf stalk. A **compound** leaf contains three (rarely two) or more distinct leaf blades, or leaflets, branching from the leaf stalk.

When analyzing leaf arrangement and type, do not use the arrangement of leaflets on a compound leaf to determine whether the leaf arrangement is opposite or alternate. Consider the compound leaf as a whole, and determine how the compound leaf sets are arranged on the main stem.

KEY TO FLOATING AQUATIC FAMILIES

STEP	OPTION A	OPTION B
1	**A.** Plants differentiated into stem with leaves, or side appendages resembling leaves, on main axis. **GO TO STEP 2**	**B.** Plants not differentiated into stem with leaves, or side appendages resembling leaves, on main axis. **GO TO STEP 3**
2	**A.** Leaves forming a circular, whorled rosette floating on the surface, leaf stalks inflated, large, robust fruit with two, three, or four hard, sharp protruding horns. **TRAPACEAE**	**B.** Leaves in two rows or spiral along an extended growth axis, leaf stalks inflated, flowers lavender to purple, seeds small, many, and without hard, protruding horns. **PONTEDERIACEAE**
3	**A.** Plants free-floating with leaves in two rows, leaf blades parallel to growth axis, upper leaf surface with many multicellular hairs. **SALVINACEAE**	**B.** Plants free-floating with leaves not in two rows, leaves elongate to orbicular, flat or globose with or without roots, leaf blades not parallel to growth axis. **LEMNACEAE**

KEY TO SUBMERGENT AQUATIC FAMILIES

STEP	OPTION A	OPTION B
1	**A.** Compound leaves finely divided into many-divided, parted, capillary, feather-like segments, not toothed. **HALORAGACEAE**	**B.** Leaves simple and opposite or alternate or whorled. **GO TO STEP 2**
2	**A.** Leaves whorled. **HYDROCHARITACEAE**	**B.** Simple leaves linear to capillary with toothed spiny margins. **NAJADACEAE**

KEY TO EMERGENT AQUATIC FAMILIES

STEP	OPTION A	OPTION B
1	**A.** Plant a vine. **CONVOLVULACEAE**	**B.** Plant erect or freestanding. **GO TO STEP 2**
2	**A.** Leaves simple, grass-like in appearance; stems usually hollow with swollen nodes; fruit a grain. **POACEAE (GRAMINAE)**	**B.** Leaves not grass-like in appearance; petals and sepals present. **GO TO STEP 3**
3	**A.** Leaves simple and alternate or opposite. **GO TO STEP 4**	**B.** Leaves compound and finely divided into thin linear segments appearing fan-shaped or hemispherical. **SCROPHULARIACEAE**
4	**A.** Leaves simple and opposite. **AMARANTHACEAE**	**B.** Leaves simple and alternate. **GO TO STEP 5**
5	**A.** Leaves two-ranked near base. **PONTEDERIACEAE**	**B.** Leaves basal rosette of strap-shaped leaves. **SPARGANIACEAE**

AQUATIC FAMILY CATALOG

The families in this catalog are listed alphabetically by scientific names. Alternate scientific names and common names are listed also. The treatment of each family includes a description of the plants likely to be encountered, a few notes on the family, a list of important members, and either a color photograph or a line drawing of one important plant in the family.

Use the catalog to verify the family of a plant after you have used the Growth Habits and Keys to Aquatic Families to identify the family.

AMARANTHACEAE, amaranth or pigweed family

VEGETATIVE

Weedy herbs and subshrubs, annuals or perennials, with erect to prostrate or trailing stems; leaves alternate or opposite, petioled or sessile, without stipules.

FAMILY IMPORTANCE AND DISTRIBUTION

About 850 species in 65 genera, cosmopolitan but mostly tropical. Most amaranths are found in weedy areas, commonly called "wastelands," because these areas are often poorly drained or subject to flooding.

IMPORTANT MEMBERS

Alternanthera philoxeroides. A major pest plant.

CONVOLVULACEAE, morning glory family

VEGETATIVE

Stems trailing on moist ground or floating, when floating usually thick and spongy, rooting at nodes. Leaves alternate, petiolate; blades variable in size and shape, ovate, triangular, lanceolate or linear.

FAMILY IMPORTANCE AND DISTRIBUTION

Circumtropical; occurs in marshy or inundated localities in pools and ditches. Often forms dense masses and may be found as a weed in rice fields. It is palatable and frequently grown as a vegetable; it is also used as a pig food and locally in medicines.

IMPORTANT MEMBERS

Ipomoea aquatica. Water spinach.

HALORAGACEAE, watermilfoil family

VEGETATIVE

Emergent herbaceous aquatic plant with leaves alternate, opposite or whorled, entire or pinnately divided, pinnately nerved. Emersed leaves whorled, opposite or alternate, with the emersed leaves much reduced and mostly leaflike.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan distribution. Eurasian watermilfoil *(Myriophyllum spicatum)* is a noxious weed infesting portions of the eastern and western United States by blocking navigation and irrigation systems and outcompeting native flora and fauna on a massive scale. Seeds are utilized and distributed by waterfowl.

IMPORTANT MEMBERS

Myriophyllum brasiliense. Parrot's feather. Was imported from South America and has become naturalized in many countries where it spreads and is a serious nuisance on a limited scale. In Java, the weed is cultivated and eaten as a vegetable.

Myriophyllum spicatum. Eurasian watermilfoil. Was imported into the United States in the 1920's and is considered a serious aquatic weed.

HYDROCHARITACEAE, frog's bit family

VEGETATIVE

Annual or perennial, dioecious or monoecious herbs. Leaves various, usually submerged, rarely floating or partly emergent.

FAMILY IMPORTANCE AND DISTRIBUTION

Fifteen genera some of which represent the most noxious aquatic pests. Cosmopolitan distribution. Representatives are rapid invaders and colonizers of aquatic systems and impact irrigation, navigation, flood control and fish and wildlife resources.

IMPORTANT MEMBERS

Elodea.
Hydrilla.
Egersia.
Nechamandra.
Maidenia.

LEMNACEAE, duckweed family

VEGETATIVE

The thallus has variously been interpreted as a modified stem, a leaf or partly stem and partly leaf. Small thalloid, entirely or partly floating or submerged herbs, solitary or connected in groups. Roots simple, several, one or absent.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan distribution. Clumping and grouping in dense floating mats in highly eutrophic waters. Problem level populations occur in many areas around the world. The duckweed family is highly utilized by waterfowl and other wildlife and often replaces noxious weed species after chemical control is utilized. The duckweed family contains the highest concentrations of protein found among aquatic plants.

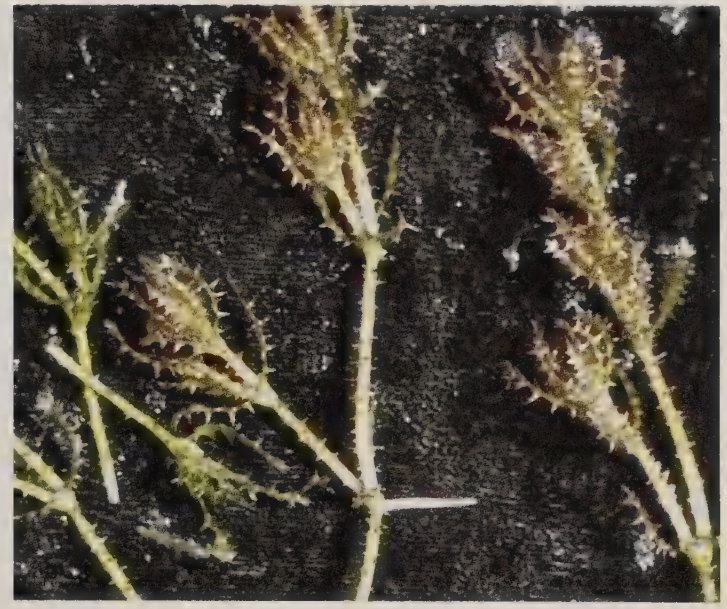
IMPORTANT MEMBERS

Lemna. An important waterfowl food plant but at high population levels outcompetes through shading native aquatic plants.

NAJADACEAE, water nymph family

VEGETATIVE

Monoecious or dioecious, obligately submerged annuals or perennials. Stems slender, either sparsely branched and diffuse or much branched and condensed. Leaves appearing opposite, pseudo-whorled or in bunches (crowded in leaf axils), simple, linear; margin usually toothed; base sheathing, occasionally auriculate.



FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan. It is found in a large variety of aquatic habitats, often growing at depths of 5 m or more. Many species are found in ricefields. On the whole *Najas* is not considered to be of great economic importance although it may be a nuisance in irrigation ditches.

IMPORTANT MEMBERS

Najas flexilis.
Najas marina. Marine najad.
Najas guadalupensis.

POACEAE (GRAMINEAE), grass family

VEGETATIVE

Herbs or less commonly woody reedlike plants, roots fibrous; leaves distichous, each with a more or less sheathing lower portion ("sheath") and a terminal usually more or less linear blade, often at the juncture of sheath and blade a fringe- or scalelike structure; in each axil often a small 2-nerved asymmetric (in transection often H-shaped) structure; leaves often with meristem near the ligule that permits continued elongation; flowers (florets) very much reduced, perfect or neuter, less commonly staminate or pistillate, usually aggregated distichously in small clusters known as spikelets.

FAMILY IMPORTANCE AND DISTRIBUTION

See POACEAE in Family Catalog section.

IMPORTANT MEMBERS

See POACEAE in Family Catalog section.

PONTEDERIACEAE, pickerelweed family

VEGETATIVE

Perennial aquatic or bog plants with floating or creeping rootstocks and sheathing leaves; leaves alternate, straplike or differentiated into petiole and blade.

FAMILY IMPORTANCE AND DISTRIBUTION

Consists of 30 species in six genera distributed in temperate and tropical regions of the world. The water hyacinth *(Eichhornia crassipes)* provides an ideal haven for minute animal life that provides food for fish and bird life. The aggressive weediness of members of the family offsets any associated assets. Water hyacinths clog waterways and outcompete native plants and animal life on a massive scale.

IMPORTANT MEMBERS

Eichhornia crassipes.
Eichhornia azurea.

SALVINIACEAE, salvinia family

VEGETATIVE

Plants minute or small, aquatic, free-floating or on mud, with a branched rhizome bearing simple roots *(Azolla)* or essentially stemless with some of the leaves modified as roots *(Salvinia);* leaves 2-ranked or in whorls, opposite or alternate, simple with unwettable hairs on the leaf surface.

FAMILY IMPORTANCE AND DISTRIBUTION

This family comprises 2 genera of wide distribution — containing 16 species which are absent from cold regions.

IMPORTANT MEMBERS

Salvinia molesta. A serious pest in Africa, Ceylon, and India. The free floating fern has reduced fishing areas, impaired navigation and threatened hydropower facilities.

SCROPHULARIACEAE, figwort family

VEGETATIVE

Mainly herbs, occasionally shrubs or rarely trees; leaves various.

FAMILY IMPORTANCE AND DISTRIBUTION

Cosmopolitan distribution with highly valued aquarium utilization.

IMPORTANT MEMBERS

Limnophila. A highly valued aquarium plant.

SPARGANIACEAE, bur-reed family

VEGETATIVE

Stems corm-like; rhizomes elongate. Leaves linear, erect or floating, sheathing at base.

FAMILY IMPORTANCE AND DISTRIBUTION

The erect species are usually gregarious and characteristically found in reedswamp communities. The floating species are found in still or flowing water in a variety of aquatic habitats. Wildfowl make nests, roost and feed in *Sparganium* stands and the fruits form an important part of their diet in late autumn and early winter. Found mostly in temperate and Arctic N. Hemisphere.

IMPORTANT MEMBERS

Sparganium erectum.

TRAPACEAE, water chestnut family

VEGETATIVE

Leaves opposite below, alternate above, dimorphic; submerged ones sessile, linear, entire; floating leaves in a rosette, stalked rhombic, with toothed margin; leaf stalk often with an ellipsoidal, spongy swelling. Fruit a large, woody or bony, variously sculptured, spinose "nut."

FAMILY IMPORTANCE AND DISTRIBUTION

Throughout the Old World, introduced in N. America and Australia. The fruits of Trapa contain much starch and fat and form a staple food in continental Asia, Malaysia, and India. Trapa is also cultivated in S. and S.E. Europe and the fruits are exported to Chinese communities in N. Europe and the USA. Trapa grows very quickly and forms stable surface-floating mats which hinder navigation; it has been reported as troublesome in Rumania, Iran, Africa, and E.N. America.

IMPORTANT MEMBERS

Trapa.
T. natans is the most common member.

GLOSSARY

Achene. A fruit with a single free seed.

Axil. The upper angle between an organ and the axis which bears it, such as the angle between the leaf and the stem bearing the leaf.

Bract. A modified, usually small, leaf subtending a flower or flower cluster.

Bulb. A cluster of leaves surrounding a bit of stem. Frequently a vegetative food storage structure, as in the onion.

Bulblet. A small bulb.

Calyx. The outer ring of floral parts; all of the sepals as a unit.

Cartilaginous. Having the properties of cartilage: white or cream color and hard-rubbery.

Caryopsis. The fruit of a grass. A grain.

Cheese. A fruit consisting of wedges which form a whole resembling a round of cheese.

Compound umbel. A flower cluster consisting of groups of flowers attached by their stalks to a common point which are in turn attached to other similar groups of flowers by secondary stalks attached to a common point.

Corm. A solid, bulblike stem, usually found underground.

Cotyledon. A seed leaf. Two cotyledons are in seeds of Dicots. One cotyledon is in seeds of Monocots.

Dicot. A plant with two cotyledons. Most dicots have net-veined leaves. Maples, roses, and snapdragons are dicots.

Embryo. A rudimentary plant. In flowering plants, the embryo is in the seed.

Endosperm. Food storage tissue in seeds.

Epihilum. A spongy white covering over the hilum in *Phaseolus* and related beans.

Epiphyte, epiphytic. Characterized by growing on other plants or objects, but not parasitically, such as orchids, bromeliads, and ferns.

Floret. A small flower. Florets in grasses consist of an inconspicuous flower surrounded by a lower (palea) and a upper (lemma) bract.

Flower. The sexual reproductive structure of flowering plants. It contains the ovary, which bears the seeds.

Fruit. A mature ovary, including seeds and other remaining flower parts.

Fruit coat. The mature ovary wall.

Fruit scar. Remaining tissue on the fruit after the departure of the flower stalk or the style.

Funiculus (plural funiculi). The connective structure between a seed and the inside ovary or fruit wall.

Grain. The fruit of a grass. The included seed is attached firmly to the inside fruit wall.

Glume. A bract subtending a cluster of grass florets.

Habit. The growth form of the plant.

Habitat. The precise set of environmental conditions in which the plant occurs.

Head. A flower cluster with closely aggregated flowers on an expanded platform.

Hilum (plural hila). The seed scar. It remains after the departure of the funiculus.

Hooked. Bearing hook-like structures.

Immersed. Growing under water.

Lemma. A bract immediately below a grass flower or grain.

Leaf. A flattened, usually green, enation from a stem.

Margin. A border or perimeter.

Mericarp. Half of a schizocarp. The usual propagule of the Apiaceae.

Monocot. A plant with one cotyledon. Most monocots have parallel-veined leaves. Lilies, grasses, and spiderworts are monocots.

Nut. A fruit with a single free seed and a bony fruit wall.

Nutlet. A small nut.

Omega-shaped. Shaped like the Greek uppercase letter omega.

Ovary. The receptacle for immature seeds of flowering plants.

Palea. A bract immediately above a grass flower or grain.

Panicle. A flower cluster with randomly branched flower stalks and main branches.

Pappus. Sepal remains atop the achenes in the Asteraceae.

Parallel-veined. Said of an organ in which the veins are so placed relative to one another that they approximate parallel lines.

Peltate. Said of a plane structure that is attached at a point on its surface rather than on the margin, such as the leaf of the garden nasturtium.

Perigynium. The envelope surrounding fruits of *Carex* in Cyperaceae.

Petal. A modified, often colored, leaf surrounding the ovary of the flower.

Petiole. The stem or stalk of a leaf.

Pinnate. Having a common elongate rachis or axis, with segments arranged either oppositely or alternately along either side.

Pistil. An ovary and associated style.

Pleurogram. A horseshoe-shaped line on both faces of seeds of Fabaceae-Caesalpinioideae and Fabaceae-Mimosoideae. The line is connected at the top in Caesalpinioideae, and is open at the top in Mimosoideae.

Propagule. A small, self-contained, propagating structure.

Rachilla. A small axis that connects florets in grass spikelets.

Radicle. The embryonic root.

Rhizome. An underground horizontal stem. Also called a rootstock.

Rib. An elongated flattened protrusion.

Rim. The perimeter.

Root. A basic underground portion of a plant. Roots usually grow down.

Rootstock. A horizontal underground stem bearing both roots and aerial stems along its axis or from its tip.

Runner. An above ground horizontal stem. Also called stolons.

Scar. A blemish left after the departure of various stalks, connectives, or protrusions. Seeds have one scar (hilum) from the departure of the funiculus. Fruits usually have two scars. One is from the departure of the flower stalk, and one is from the departure of the style.

Schizocarp. The fruit of the Apiaceae. It consists of two halves which separate at maturity.

Sectoroid. A shape with two flat intersecting faces and a rounded back, like sections of an orange.

Seed. The sexual propagule of flowering plants and related plants. Flowering plant seeds consist of a seedcoat, endosperm, and an embryo.

Seedcoat. The exterior covering of seeds.

Sepal. A modified, usually green, leaf subtending the petals.

Sessile. Joined directly by the base without a stalk, pedicel, or petiole.

Sexual. In flowering plants, refers to reproduction involving flowers.

Silique. The fruit of the Brassicaceae. Siliques contain two halves which fall, leaving a central papery partition.

Simple umbel. Also called umbel. A flower cluster with all flowers attached by flower stalks to a common point.

Spike. A flower stalk with flowers borne directly on a single axis.

Spikelet. A small spike.

Stem. A basic part of a plant. Stems are usually above ground and grow up.

Stipule. An appendage frequently occurring at the base of a leaf.

Stolon. An above ground horizontal stem. Also called runner.

Style. The projecting member above an ovary.

Style scar. The blemish left on the ovary or fruit wall by the departure of the style.

Tinsellate. Bearing small secondary hairs on a main hair or scale. Pappus hairs of the Asteraceae are tinsellate.

Tuber. A swollen underground stem, as in the potato.

Turion. A scaly, often thick and fleshy, detached winter bud by means of which many water plants survive winter.

Umbel. Also called simple umbel. A flower cluster with all flowers attached by flower stalks to a common point.

Vegetative. Other than sexual. In flowering plants, refers to all structures other than the flower or structures arising from the flower.

Wing. An elongated, very flattened and expanded protrusion.

Whorl. A ring of leaves, flower parts, or flowers occurring at a single node.

BIBLIOGRAPHY

Beijerinck, W. *Zadenatlas der nederlandische Flora...* Wageningen: H. Veenman & Zonen, 1947.

Bertsch, K. *Handbücher der praktischen Vorgeschichtsforschung: Früchte und Samen.* Stuttgart: Enke, 1941.

Brouwer, W. and A. Stählin. *Handbuch der Samenkunde für Landwirtschaft, Gartenbau und Forstwirtschaft...* Frankfurt (Main): DLG, 1975.

Cook, C.D.K. *Water Plants of the World.* The Hague: Dr. W. Junk b.v., Publishers, 1974.

Correll, D.S. and H.B. Correll. *Aquatic and Wetland Plants of Southwestern United States.* Environmental Protection Agency. Washington D.C.: U.S. Government Printing Office, 1972.

Delorit, R.J. *An Illustrated Taxonomy Manual of Weed Seeds.* River Falls, Wisconsin: Agronomy Publications, 1970.

Dobrokhotov, V.N. *The Seeds of the Weed Plants.* Moscow: Agricultural Literature, 1961.

Eyles, D.E. and J. Robertson, Jr. *A Guide and Key to the Aquatic Plants of the Southeastern United States.* U.S. Dept. Int. Cir. 158, 1963.

Fassett, N.C. *A Manual of Aquatic Plants.* Madison: University of Wisconsin Press, 1960.

Fong, C.H. *Agricultural and Horticultural Seeds in Malaysia.* Malaya: College of Agriculture, 1969.

Gaertner, J. *De fructibus et seminibus plantarum, volumen alterum...* Tübingen: Guilielmi Henrici Schrammii, 1791.

Gunn, C.R. "Seed Collecting and Identification." Edited by R.T. Kozlowski. *Seed Biology* 3:55-144. New York: Academic Press, 1972.

Gunn, C.R. "Seeds and Fruits of Papaveraceae and Fumariaceae." *Seed Science and Technology* 8 (1980):3-58.

Heinisch, O. *Samenatlas der wichtigsten Futterpflanzen und ihrer Unkräuter.* Berlin: Deutsche Akademie der Landwirtschaftswissenschaften, 1955.

Hitchcock, A.S. and A. Chase. *Manual of the Grasses of the United States.* Washington, D.C.: U.S. Government Printing Office, 1950.

Holm, L., J.V. Pancho, J.P. Herberger, and D.L. Plucknett. *A Geographical Atlas of World Weeds.* New York: Wiley, 1979.

Holm, L.G., D.L. Plucknett, J.V. Pancho, and J.P. Herberger. *The World's Worst Weeds: Distribution and Biology.* Honolulu: University Press of Hawaii, 1977.

Hotchkiss, Neil. *Common Marsh, Underwater and Floating-Leaved Plants of the United States and Canada.* New York: Dover Publications, Inc., 1972.

Hutchins, R.E. *The Amazing Seeds.* New York: Dodd, Mead and Co., 1965.

Isely, D. "Investigations in Seed Classification by Family Characteristics." *Iowa Agricultural Experimental Station Research Bulletin* 351 (1947):1-380.

Koehn, D. "Identificacão de algumas invasoras encontradasem sementes das principais espécies forrageiras, produzidas no rio grande do sul." *Boletim Técnico de Instituto de Pesquisas Agronomicas Porto Alegre* 1 (1977): 3-96.

Korsmo, E. *Ugressfrø Unkrautsamen: Weed Seeds.* Oslo: Gyldendal Norsk, 1935.

Lopinot, A.C. *Aquatic Weeds -- Their Identification and Methods of Control.* Fish. Bul. No. 4. Springfield, Ill.: Dept. of Cassualo Div. of Fish, 1971.

Magurk, J. *Weed Seeds.* Wellington, New Zealand: Ministry of Agriculture and Fisheries, 1974.

Martin, A.C. "Comparative Internal Morphology of Seeds." *American Midland Naturalist* 36 (1946): 513-682.

Martin, A.C. and W.D. Barkley. *Seed Identification Manual.* Berkeley: University of California Press, 1961.

McClure, D.S. "Seed Characters of Selected Plant Families." *Iowa State College Journal of Science* 31 (1957):649-682.

Montgomery, F.H. *Seeds and Fruits of Plants of Eastern Canada and Northeastern United States.* Toronto: University of Toronto Press, 1977.

Murley, M.R. "Seeds of the Cruciferae of Northeastern North America." *American Midland Naturalist* 46 (1951):1-81.

Musil, A.F. *Identification of Crop and Weed Seeds.* Agriculture Handbook 219. Washington, D.C.: U.S. Government Printing Office, 1963.

Pancho, J.V. and M.M. Guantes. "Seed Identification of Common Weeds in Lowland Rice Fields." *Philippine Agriculturist* 46 (1962):481-513.

Reed, C.F. and R.O. Hughes. *Selected Weeds of the United States.* Washington, D.C.: U.S. Government Printing Office. 1970.

Reed, C.F. and R.O. Hughes. *Economically Important Foreign Weeds: Potential Problems in the United States.* Agriculture Handbook 498. Washington, D.C.: U.S. Government Printing Office, 1977.

Roe, Colin. *A Manual of Aquarium Plants.* Monkspath, Shirley, Solihull, England: Shirley Aquatics, Ltd., 1967.

Schopmeyer, C.S. *Seeds of Woody Plants in the United States.* Agriculture Handbook 450. Washington, D.C.: U.S. Government Printing Office, 1974.

Scurti, J. "Chiave analitica per il riconoscimento delle piante infestanti attraverso i semi." *Supp. Annali Della Sperimentazione Agraria* n.s. 2 (1948):1-45 et icon.

Shinbara, B.H. *Noxious Weed Seeds of Hawaii. s.l.:* Department of Agriculture, Division of Plant Industry, 1966.

Stefferud, A. *Seeds: The Yearbook of Agriculture.* Washington, D.C.: U.S. Government Printing Office, 1961.

Stodola, Dr. Jiri. *Encyclopedia of Water Plants.* New Jersey: TFH Publications, Inc., 1967.

Tarver, David P., John A. Rodgers, Michael J. Mahler, and Rober L. Lazor. *Aquatic and Wetland Plants of Florida.* Tallahassee, Florida: Bureau of Aquatic Plant Research and Control, Florida DNR, 1979.

Vargas, D., J. Cardenas, and C. Romero. *Catalogo de semillas de malezas de clima frio. s.l.:* Instituto Colombiano Agropecuario, *s.a.*

Weldon, L.W., R.D. Blackburn, and D.S. Harrison. *Common Aquatic Weeds.* Agriculture Handbook 352. Washington, D.C.: U.S.D.A., 1969.

Wojciechowska, B. "Morphology and Anatomy of Fruits and Seeds in the Family Labiatae with Particular Respect to Medicinal Species." *Monographiae Botanicae* 21 (1966):1-298.

INDEX TO PLANT NAMES

This index alphabetically lists common names and generic names of terrestrial and parasitic plants, and identifies their scientific family names.